CALIFORNIA
OIL WORLD

PUBLISHED TWICE A MONTH
FOR TIMELY, COMPLETE
CALIFORNIA OIL NEWS COVERAGE

• FIRST ISSUE NOVEMBER, 1945
VOL. 38 • NO. 21
WHOLE NO. 1691

PETROLEUM PUBLISHERS, INC.
MEMBER AUDIT BUREAU OF CIRCULATIONS
W. C. MONROE—President and Editor •
117 WEST 9TH STREET
LOS ANGELES 15, CALIFORNIA
KINZIE MILLER—Vice President

New York Office: 17 E. 48th St., New York 17, N. Y.— Telephone: WIckersham 2-1127 — John H. Kunkel, Manager

California Oil World is published twice a month at 117 West 9th St., Los Angeles 15, California. Entered as Second-Class Matter, April 29th, 1944, at the post office at Los Angeles, California, under the Act of March 3, 1879. Subscription price $1 per year in U. S. and possessions, $2 in foreign countries including Canada. Member of the Audit Bureau of Circulations.

November 15th, 1945
Telephone Number TUcker 2571

Carrington Kung

With oil men heading for Chicago, where the American Petroleum Institute will open its convention November 12, and Congress impatiently waiting for the gun which means a good, long Christmas holiday, plans and projects involving the oil industry are in their usual pre-Christmas stall.

The last remnants of the Petroleum Administration for War will be gone, by the time Congress returns, but the Petroleum Industry War Council is reluctant to dissolve an organization which succeeded so remarkably in maintaining cooperation between industry and Government during the difficult war years. Reorganization of PIWC as a nationwide peacetime council is very much in the thoughts of the membership.

California's most serious problem, the tidelands ownership controversy, appears also to have been put over —with a host of other oil matters— until sometime in January when the Senate Judiciary Committee expects to hold hearings on the pending legislation under which the U. S. will quitclaim any claim to the lands lying between the high-water tidemark and the three-mile maritime limit. Current consideration of the Government's suit against the State of California, to establish U. S. title to the tidelands, will continue until California's reply to the Justice Department complaint is received, Dec. 28. A decision in the United States Supreme Court cannot come before 1946.

Another important matter which seems to be temporarily suspended is the anti-trust suit against the API and the major oil companies and their subsidiaries. . . . Some talk about a new consent decree, with 30 days notice given before the decree is entered in the court.

* * *

Talk of the town was the October 23rd testimonial dinner given by the PIWC in honor of Petroleum Administrator Ickes and Deputy Petroleum Administrator Ralph K. Davies at the Hotel Statler. Accustomed as it is to imposing banquets, the Nation's Capital had to admit the Ickes-Davies wing-ding surpassed them all in attendance (approximately 700), lavishness and sincere testimonials to the two guests of honor.

Of Ickes, PIWC said "for his leadership, for his indomitable perserverance, for his achievements, and for his understanding, the American petroleum industry acknowledges him as a true leader of World War II." The praise bestowed upon Davies was, if anything, even more glowing:

"By his selfless service in time of national peril, by his great war-time achievement, and by his major contribution to victory, Mr. Davies has earned enduring glory and undying gratitude from the oil industry, from his own country, and from every land that values freedom."

Bronze plaques, each bearing their individual portraits, carved by a famous New York sculptor and the engraved signatures of the members of the council, were presented Ickes and Davies. Invited guests received a three-inch bronze medallion with the Ickes portrait on one side and Davies' profile on the other. As an additional token of the esteem in which the PAW chiefs are held by the oil industry, Davies received a magnificent, hand-painted world globe and Ickes the promise of a portrait of Mrs. Ickes,—to be painted by any portrait painter of his selection.

* * *

The PIWC banquet was not without its repercussions. Considerable eyebrow-lifting was observed in the East over the failure of Standard Oil Co. of California to offer Davies, the company's senior vice-president before he was called to Washington in the spring of 1941, its top post. Davies' stature among the Eastern companies has brought tempting East Coast offers.

* * *

The surge of sentiment for an "advisory agency" of industry representatives to replace the folding PIWC was the subject of much discussion at the next-to-the-last council meeting.

Council Chairman William R. Boyd, Jr., intends to push for such

(Continued on Page 36)

FOR BULK STATION LOADING

The Ingersoll-Rand Motorpump, especially constructed for bulk station duty, eliminates the difficulties often encountered in handling petroleum products. To reduce leakage is all-important. Ingersoll-Rand does this by employing deep stuffing boxes . . . special stick lubricant for sealing and lubricating the stuffing boxes . . . packing under the shaft sleeve and a gasket between the impeller and sleeve.

Highest efficiency is obtained by careful hydraulic and mechanical design, together with simple rigid and sturdy construction. Many installations testify to the long life and ease of maintenance.

Motors used are of the explosion-proof type. The entire unit is completely weatherproof and may be installed outdoors without protective cover.

Ingersoll-Rand

11 Broadway, New York 4, N. Y.

6-745

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • OIL AND GAS ENGINES

Application of Alignment Chart to Solving Rapidly Production Forecasting Problems

By L. R. MERRYMAN
The British-American Oil Producing Co.

The chart described in the first July issue of the CALIFORNIA OIL WORLD was designed to find the decline rate when the total production and number of years are assumed. The accompanying chart is designed to determine the number of years required to produce a given amount of oil when the current rate is known or assumed. This chart, like the others, can also be used in reverse to solve other problems.

The accompanying chart, like those described in the previous issues, is based on the laws of the geometrical progressions. The general series and the derived formulas were discussed in the previous articles.

The principal applications of the chart shown in this article are the determination of the economic life of a property when the total future commercial production has been determined by a volumetric estimate and the quick determination on the reasonableness of estimates of future production made by volumetric methods.

For purposes of illustration a hypothetical property is set up. It is assumed that the initial or present production is 150 barrels per day and the property will decline at the rate of 12 per cent per year. The future and cumulative production is shown in the following tabulation:

In order to show the shape of the curve when a property declines at 12 per cent per year the production tabulated above is shown on the accompanying curves, Figures No. 1 and No. 2. For reference it is plotted on both semi-log and regular coordinate paper.

Practical application and use of the chart are described below:

EXAMPLE NO. 1: A volumetric estimate of the future production of a property has been made and it is believed that ultimately 330,000 barrels will be produced. It is desirable to know how many years it will take to produce the oil if the property declines at the rate of 12 per cent per year. The property is currently producing at the rate of 150 barrels per day. This is the initial or present production in the above tabulation. The solution is shown on Figure No. 3 and it is determined as follows:

A straight edge is placed at 150 barrels daily on Scale A, which shows rate of production, and at 330,000 barrels on the 12 per cent per year line on Scale B. The answer is found by drawing a straight line, based on the points selected, to the 12 per cent line on Scale C. The answer in the example chosen, is 10 years. It should be noted that this is the 9th succeeding year in the tabulation above. This is due to counting the production during the period called present as the first full year.

EXAMPLE NO. 2: A property is

Fig.1

Year	B/D	Annual	Cumulative
Present or initial	150	54,750	.....
1st Succeeding Year	132	48,180	102,930
2nd Succeeding Year	116	42,340	145,270
3rd Succeeding Year	102	37,230	182,500
4th Succeeding Year	90	32,850	215,350
5th Succeeding Year	79	28,835	244,185
6th Succeeding Year	70	25,550	269,735
7th Succeeding Year	62	22,630	292,365
8th Succeeding Year	55	20,075	312,440
9th Succeeding Year	48	17,520	329,960
10th Succeeding Year	42	15,330	345,290
11th Succeeding Year	37	13,505	358,795
12th Succeeding Year	33	12,045	370,840
13th Succeeding Year	29	10,585	381,425
14th Succeeding Year	26	9,490	390,915
15th Succeeding Year	23	8,395	399,310
16th Succeeding Year	20	7,300	406,610
17th Succeeding Year	18	6,570	413,180
18th Succeeding Year	16	5,840	419,020
19th Succeeding Year	14	5,110	424,130

Here is the New Lane-Wells

FLOSEAL PACKER RING SET

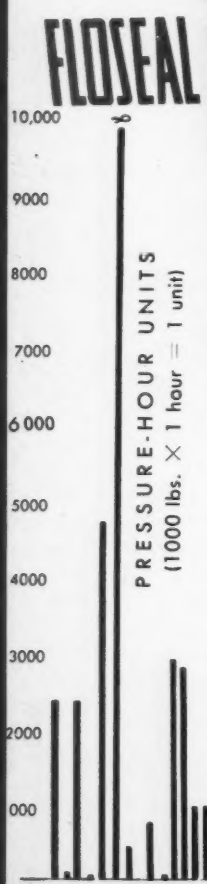
for Olympic Packers

—Designed for High Performance
Under the Severe Operating Conditions
of Tomorrow's 20,000 Ft. Wells

Floseal is the new Lane-Wells integrated packer ring system which gives better packer control and easier, more positive operation under the high temperatures and differential pressures encountered in today's deeper wells. Physical characteristics of the rings are graded so that each pair of outer rings confines and seals the flow of the inner pair as loading is applied. Under progressive loading the inside rings expand first until the load is picked up by the adjacent outside pair. Setting is accomplished with minimum weight yet the seal will hold against high differential pressures and high temperatures.

For complete details and recommendations about Olympic Packers equipped with Floseal Packer Rings, call or write your nearest Lane-Wells Branch Office.

Tomorrow's Tools—Today!



52 TESTS This bar chart compares the performance of the 52 ring constructions studied. The FLOSEAL test was terminated after 2496 hours at 300° F. and 4000 lbs. pressure because no additional extrusion or loss of pressure was noted which indicated the test could perhaps be continued for many more months—even years—without noticeable effect upon the pack-off properties of the ring assembly.

LANE WELLS COMPANY

Los Angeles — Houston — Oklahoma City

General Offices, Export Office and Plant:

5610 S. Soto St., Los Angeles 11, California

24-HOUR SERVICE 35 BRANCHES

currently producing oil at the rate of 150 barrels per day and it is desired to know how much oil it will produce in ten, fifteen, and twenty years, if the property declines at the rate of 12 per cent per year. The solution is illustrated on Figure 4. The procedure is as follows:

A straight edge is placed at 150 barrels per day on Scale A and at 12 per cent per year on the 10-year line on Scale C. The answer, approximately 330,000 barrels, is found on Scale B by reading the Scale opposite the intersections of the straight edge line drawn to solve the problem and vertical line for the 12 per cent per year decline.

In a like manner, the production and readings for the 15 year and 20-year periods can be made. These lines are shown on Figure No. 4. The values found are as follows:

Total for 15-year period—just under 400,000 barrels.
Total for 20-year period—Approximately 425,000 barrels.

It should be noted that the point on Scale B falls in the same position as on Figure 3, even though the problem and solution are quite different.

The writer wishes to emphasize again that these charts are designed to speed up preliminary estimates of future production or to check work that has been done in detail. The chart shown in the first February issue of the CALIFORNIA OIL WORLD, however, can be used for routine calculations with a degree of accuracy that is within the limits of the data being studied. The conditions under which the charts can be used and their limitations have already been enumerated in previous issues and are not repeated here.

The purpose of this series of articles has been to show the application of the alignment chart to the solution of production forecasting problems. There are, of course, many variations that can be made of the charts presented, as well as many other charts that can be designed.

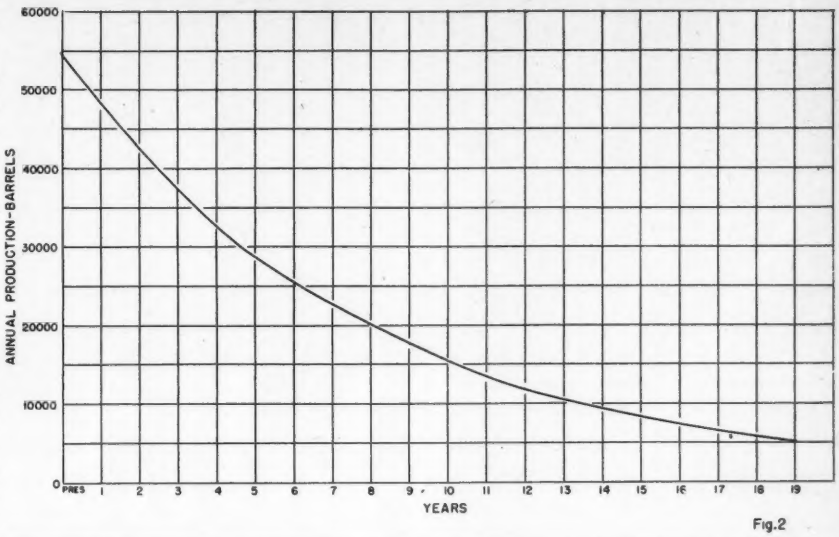


Fig.2

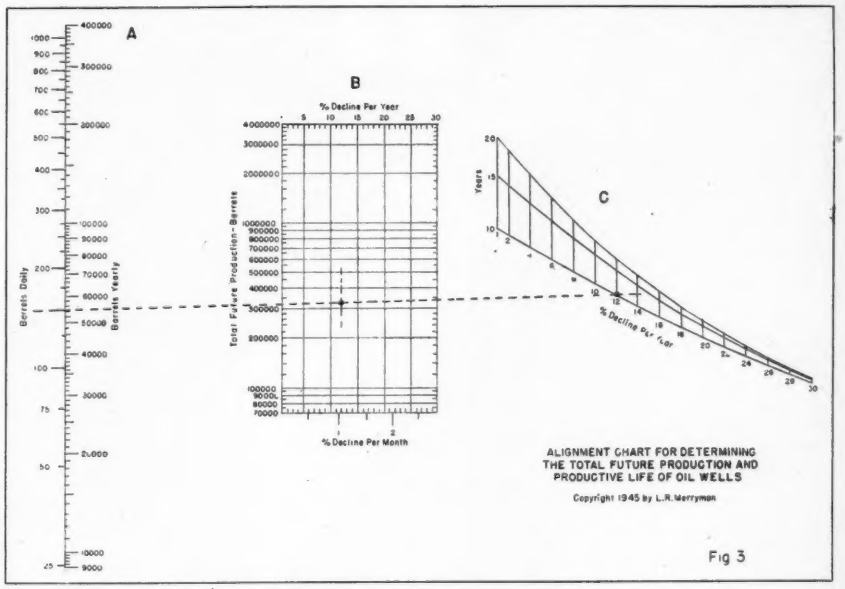


Fig 3

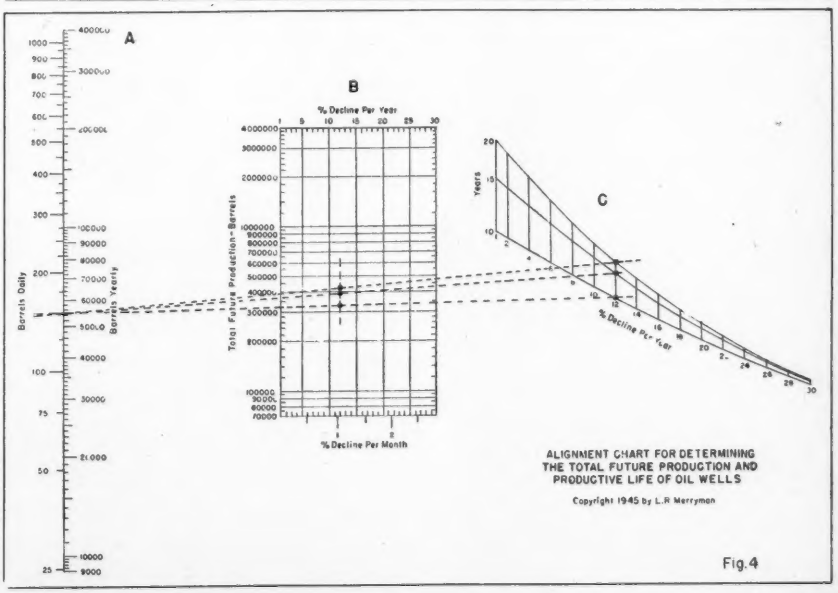


Fig.4

Halliburton

NOW . . . WATCH THEM ROLL!

● With restrictions being lifted and trained men returning from service, HOWCO is set to go . . . set to point its research and service facilities to the industry's peacetime drilling and exploration programs . . . set to get there with what it takes to bring operators, regardless of location, the full benefits of HOWCO cementing, acidizing, electric logging, formation testing, etc.

HALLIBURTON OIL WELL CEMENTING
DUNCAN, OKLAHOMA

Peace-Time Utility of War-Time Petroleum Refining Processes

F. D. PARKER
Development Engineer
Presented at the annual meeting of the California Natural Gasoline Association, Los Angeles, California, October 12, 1945.

With the successful completion of the war against the Axis nations, The Petroleum Industry's major task changes from the production of war materials to the production of fuels, lubricants and specialties required by industry and the consumer public. The following figures, abstracted from recent reports, indicate the size of the task performed by the refining branch of the industry and the magnitude of the reconversion problem in terms of capital equipment involved.

Prior to the war, the production of 100 octane gasoline in the U.S.A. was about 46,000 BPD. In four years, this was increased to about 525,000 BPD. This involved operation of a relatively small number of pre-war units, plus construction and operation of many new units; the latter running about as follows (for the United Nations, with most of the plants in the U. S.A.):

Type Plant	Approximate Number of Units
Alkylation	75
Catalytic Cracking	77
Isomerization	37
Hydrogenation	4
Dehydrogenation	2
Miscellaneous	16

2. The Petroleum Industry and Government spent approximately $1,000,000,000 on facilities related to the production of 100 octane aviation gasoline. Of this amount, about $850,000,000 was spent for facilities within the Continental U.S.A., $620,000,000 of this being spent by private industry, a private investment percentage greater than made by any other industry during the war.

3. Some of the facilities constructed in connection with the toluene program and the $800,000,000 synthetic rubber program (both largely government financed) have potential peace-time applicability.

The utility of the war-built plants in the manufacture of peace-time refined products is of interest not only to the refiners who installed one or more of these units for the production of aviation gasoline, but also to those refiners who, through consideration of individual economic, geographical, or transportation factors were not in a position to participate in the 100 octane program, or phases of the toluene and synthetic rubber programs, and now find themselves entering the post-war period with pre-war refining facilities operating in competition with more modern facilities of other refiners. While the problem of what plants can be operated economically is one that must ultimately be reviewed by each individual refiner in the light of conditions peculiar to his situation, there are certain more or less general technico-economic considerations which it is the purpose of this paper to review.

Predicted Gasoline Production and Quality

Considerable thought has been given by various analysts to the quantity and quality of postwar gasoline.

R. W. Reinhart (1) presents figures on past and predicted future gasoline consumption in the U. S. as follows:

Year	Million Barrels Per Year
1935	450
1936	475
1937	515
1938	525
1939	550
1940	590
...	...
...	...
1945	599
1946	610
1947	700
1948	745
1949	756

Burrill (2) is in general agreement with the above predicted postwar figures. While disturbances in the war-peace transition will undoubtedly cause marked deviations from the 1945-1946 figure, the predicted consumption for 1947-1949 appears sound.

Risk (3) reports distribution of various quality gasolines for the pre-war and predicts postwar distribution as follows:

Pre-war and Predicted Post-war Gasolines

Grade	Octane Rating ASTM Motor		% of Total Gasoline	
	Pre-war	Post-war	Pre-war	Post-war
Aviation	91–100	100	2	6–8
Premium	80	85–88	10	10–20
Regular	75	78–80	78	60–75
Third Grade	64	68–70	10	5–15

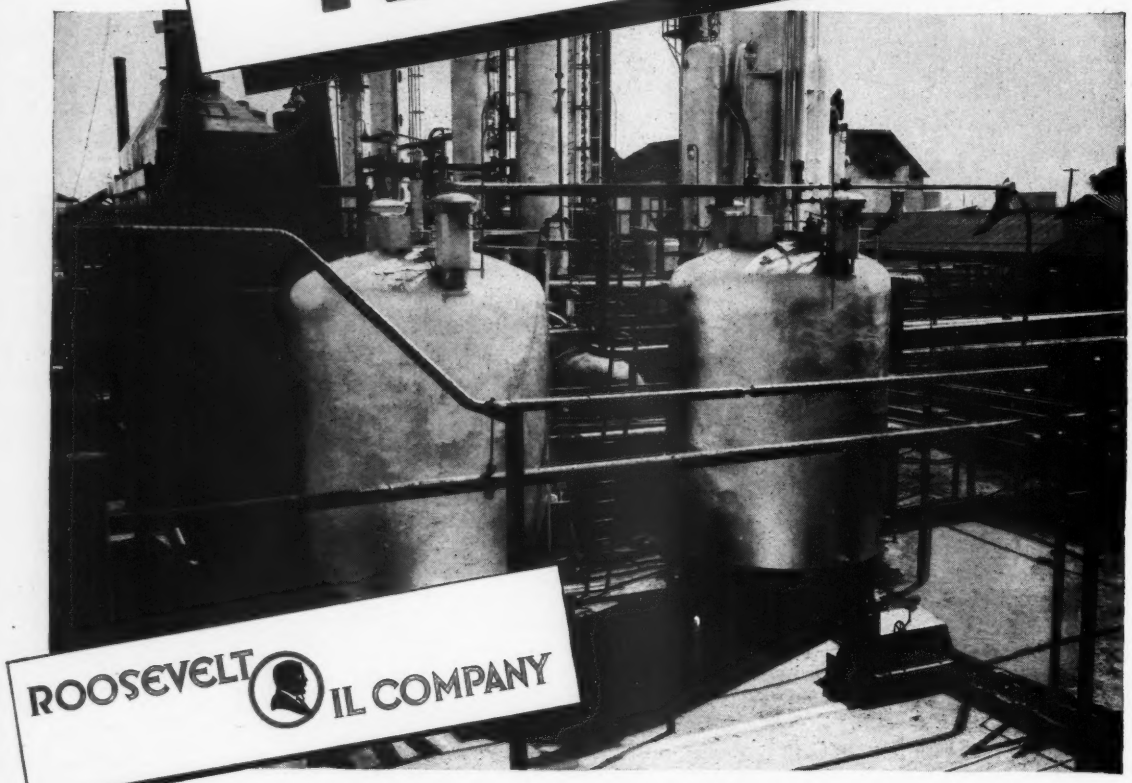
There is a strong feeling in the aviation industry that a considerable portion of the aviation gasoline cited by Risk as averaging 100 octane will actually be of super-fuel quality such as alkylate-plus-isopentane-plus-lead. This will have a bearing on the economic operability of processes like alkylation and isomerization. Actual marketing trends show that regular grade and premium grade motor gasolines are, in many cases, already in the above predicted range.

Refinery capacity figures are reported (4) as follows:

Year	Crude Oil Charge Capacity Barrels/Day
1935	3,700,000
1936	3,850,000
1937	3,900,000
1938	3,900,000
1940	4,200,000

MICHIGAN REFINERS

. . . INCREASE RUNS, PROTECT EQUIPMENT WITH PETRECO



The above picture shows the Petreco Desalting installation of the Roosevelt Oil Company of Mt. Pleasant, Michigan. Referring to the performance of this equipment an officer of the company remarks:

"These two Desalter units handle approximately 5000 bbls. of crude oil per day. The crude charge averages from 60 to 150 lbs. of salt per 1000 bbls. of crude and salt removal averages approximately 93% Use of these units enables us to run our naphtha unit, which receives our crude charge, from 90 to 100 days before washing and cleaning is necessary. We have also found that the use of the Desalters has made a material saving in operation, due to longer life on exchanger tubes, still tubes and condenser coils."

PETROLEUM RECTIFYING COMPANY
5121 South Wayside Drive, Houston 1, Texas
530 West Sixth Street, Los Angeles 14, California
648 Edison Building, Toledo 4, Ohio
Representatives in principal production and refining centers

PETRECO

Desalting • *Electrical Process* • Dehydrating

1941 4,500,000
1943 4,500,000
1944 4,700,000
1945 4,850,000

Referring to the above figures, it is evident that the petroleum refining industry is faced with the problem of producing motor gasolines 3-8 octane points above pre-war values with yields of gasoline from crude oil equal to or exceeding pre-war yields. From the point of view of number of installations (as listed above), the most important war-time processes available for solving this refining problem are alkylation, isomerization, and catalytic cracking. Catalytic polymerization and catalytic reforming (hydroforming) are pre-war processes whose applicability to post-war operations is also of interest.

War-Time Processes Available for Peace-Time Operations

As previously noted, the major private petroleum industry investment in new refining facilities during the war years was for high octane gasoline plants and related auxiliaries. Papers describing the various catalytic cracking processes (5, 6, 7, 8), Alkylation (9), Butane and Pentane-Hexane Isomerization (10) and Hydroforming (including Toluene purification) (11, 12) and integration of certain of these processes for high octane gasoline manufacture (13) have given adequate coverage of their respective subjects so that in this paper no attempt will be made to recapitulate previously published characteristic features of process, technology, operation, and refinery integration except as pertinent to the considerations at hand.

The significant items that are the concern of this paper are summarized on the following pages.

While the above processes are available to all refiners for postwar operation, the size of any installation will vary with the crude oil charge capacity, the nature of the crude processed, the products normally manufactured, and the details of existing process facilities and operations. As a matter of interest in determining the approximate size of individual modern refining units that might be operated for peace-time products, Continental U. S. Refineries may be segregated into the following crude oil charge capacity groupings:

The above figures indicate that refineries in the 1,000-5,000 BPD range predominate numerically, but have total charge capacity only above 8.0% of the U. S. total. Refineries over 50,000 BPD capacity represent 45% of total U. S. crude capacity, but are few in number, and in most cases owned by companies whose problems are handled individually and whose economic position, due to size, generally permits them to operate any or all of the processes installed by smaller refiners. The 5,000-50,000 range includes about 40% of the refineries and 46.6% of the crude oil charge capacity. Refineries in the 5,000-50,000 BPD group will, therefore, as a group, be most concerned with the applicability of war-time refining processes to post-war operations, and the weighted average of their actions is most significant in setting product quality levels.

In considering catalytic cracking, alkylation, isomerization and the like in the light of peace-time conditions, it is convenient to estimate the approximate capacity ranges for each as related to refinery crude oil charge capacity. For purposes of this paper, three typical refinery capacities have been selected for illustrating the effect of plant capacity on economics. These refinery capacities are 5,000 BPD, 15,000 BPD, and 30,000 BPD corresponding to significant 5,000-50,000 BPD range described above. In the following discussions it is understood that the 5,000 BPD, 15,000 BPD, and 30,000 BPD figures refer to refining crude processed and are in addition to any other (and usually smaller) quantities processed primarily for products other than gasoline (such as lube oils, road oils and asphalts, Diesel and other distillate fuels, solvents, waxes, etc.)

On the above basis, and by making use of generalized yields data characteristic of processing a typical 31° API Los Angeles Basin Crude Oil (13) it is possible to set up figures which will approximately bracket the range of individual plant capacities corresponding to the 5,000 BPD, 15,000 BPD, and 30,000 BPD refineries chosen for illustrative purposes. These are summarized on next page.

The relatively wide range shown is explainable by the variety of refinery processing schemes and flexibility of operating conditions.

Approximate Relative Economics of Peace-time Operation of War-time Processes

The following discussion presents the results of some comparative studies of alkylation, isomerization, catalytic cracking, and other operations for motor gasoline production.

It is recognized that it is not possible to present firm figures applicable to every refiner's situation, since plant investment and operating cost, product yields and qualities, and charge stock and product values vary widely. However, by averaging typical data for each process, and prorating direct and indirect charges, it is possible to set up curves showing value of product from each process as a function of plant capacity, and charge stock

Process	Charge	Product	Approximate Volume Yield
Catalytic Cracking	Narrow or wide-boiling virgin coke distillate, or visbreaker gas oil, or deasphalted resid.	**Gasoline** 78-82 ASTM 88-95 Research	40-65%
Alkylation	Olefins: Propene, Butenes, Pentenes, Polymer Isoparaffin: Isobutane	**Aklylate Gasoline** 88-94 ASTM 88-96 Research	160-170% on Olefin
Polymerization	Propene, Butenes	**Polymer Gasoline** 85-95 ASTM 95-105 Research	65-75% on Olefin
Butane Isomerization	**Normal Butane** 92 ASTM	**Isobutane** (for alkylation)	100%
Pentane Isomerization	**Normal Pentane** 62 ASTM	**Isopentane** 92 ASTM	96-100%
Catalytic Reforming (Hydroforming)	**Naphtha** 45-55 ASTM	**Gasoline** 75-82 ASTM 80-90 Research	75-90%

Don't choke your well to death

Many an oil well has died a premature and untimely death as a result of strangulation. Sometimes these wells died with their boots on from too much sand in their throats, at other times of gradual strangulation caused by inadequate drainage.

Good screen pipe properly selected to fit conditions may avoid such costly losses. Studies of hundreds of oil well case histories and producing sands have shown that good screen pipe must have *all* four basic qualities of:

(1) High resistance to mechanical failure—not less than 95% of original pipe strength.
(2) An undercut slot which insures self-cleaning, avoids clogging.
(3) A hardened slot which resists sand abrasion.
(4) A proper slot pattern which provides maximum drainage at minimum cost.

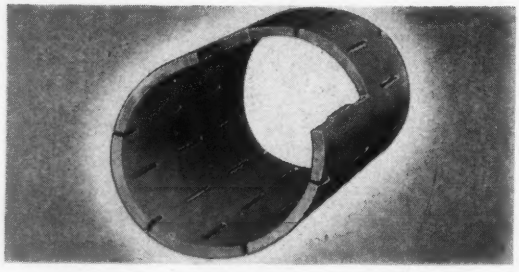
Only Kobe slotted pipe gives *all* four basic qualities. Its extra cost is cheap insurance against choking your oil well and losing production.

Specify Kobe slotted pipe on every screen job and thus be sure you obtain maximum protection. Any Kobe representative will be glad to help you select the right slot arrangement to insure maximum results with the lowest safe cost.

KOBE Incorporated—*General Offices & Plant:* 3040 East Slauson Ave., Huntington Park, Calif. *Mid-Continent Division Offices and Shops:* 230 S. E. 29th St., Oklahoma City, Okla. California *Division Offices:* 217 Wilson Bldg., Huntington Park, California—*Export Agent:* Petroleum Machinery Corporation, 30 Rockefeller Plaza, New York, N.Y.

KOBE

ONE [illegible] STRIES



To hold back sand particles and at the same time allow the free flow of oil, Kobe screen casing is available with slots cut to any required dimensions or patterns. It is guaranteed to retain 95% of the strength of blank pipe.

Kobe Slots cost less than sand troubles

Approximate Distribution of U. S. Refining Capacity (14)

Individual Refinery Crude Oil Charge Capacity	Approximate Number of Refineries	% of Total U. S. Refineries	Approximate Crude Oil Processed, B/D	Crude Oil, % of U. S. Total
Barrels per Day				
Less than 1,000	53	13.	20,000	0.4
1,000- 5,000	162	41.	400,000	8.0
5,000- 10,000	71	18.0	480,000	9.6
10,000- 25,000	59	15.1	850,000	17.0
25,000- 50,000	28	7.2	1,000,000	20.0
50,000-100,000	13	3.3	950,000	19.0
100,000 plus	10	2.5	1,300,000	26.0
	396	100.0	5,000,000	100.0

cost. Refinery overhead and management charges, and taxes and interest are not considered in this study, since they vary widely through the industry. With the understanding that the calculated figures are relative rather than absolute, it is then possible to draw some conclusions regarding utility of each war-time process in peacetime operations.

Following are the basic figures used or considered in these comparative studies:

Alkylation

Alkylation of olefin with isoparaffins to form high-octane gasoline components is not strictly a "wartime" process. The first commercial unit started operations in 1938, but by far the majority of the present 60 plants (sulfuric acid and HF acid processes) were constructed during the war. The alkylation process contributed significantly to the 100-octane aviation gasoline program with alkylate production reaching about 130,000 B/D (15). Applicability of the process to postwar motor gasoline operation is, of course, dependent on competitive economics.

Figure I, presents typical calculated alkylate gasoline costs as a function of alkylation plant capacity and raw material cost.

The data given on next page, abstracted from Figure 1, summarize costs for two "extreme" conditions:

With alkylate in average blends of 79 ASTM regular and 86 ASTM premium gasolines carrying a lead credit of 3-4 cc per gallon (0.6-.8¢ per gallon) and with refinery netbacks of 6¢ per gallon and 7¢ per gallon respectively for regular and premium gasolines, it is possible for even a relatively small refiner to produce alkylate economically for premium gasoline provided the charge stock to the process is worth 2¢ per gallon ($.84 per barrel) or less. A large refiner could probably blend this alkylate to 6¢ regular gasoline. This would in general, limit the olefin charge stock to excess butenes beyond those which the refiner can use directly in motor gasoline as limited by vapor pressure specifications, and to propene. Similarly, isobutane from natural gas and gasoline and cracking operations (at about 2¢ per gallon, where so available) rather than isobutane synthesized from normal butane is called for. Since the operation is close to marginal, detailed study of each individual case is required.

Approximate Range of Potential Capacity of Individual Plants, Barrels per Day

Process	5,000 BPD Refinery	15,000 BPD Refinery	30,000 BPD Refinery
Thermal or Catalytic Cracking	2,000–4,000 (3,000 av.)	6,000–12,000 (9,000 av.)	12,000–24,000 (18,000 av.)
Alkylation (Alkylate Gasoline)			
Propene	200– 300	600– 900	1,200– 1,800
Butene	200– 300	600– 900	1,200– 1,800
Pentene	200– 300	600– 900	1,200– 1,800
Total	600– 900	1,800– 2,700	3,600– 5,400
Propene-Butene Polymerization	150– 250	450– 750	900–1,500
Butane Isomerization	100– 500	300–1,500	600–3,000
Pentane Isomerization	50– 200	150– 600	300–1,200
Catalytic Reforming (Hydroforming)	1,000–1,500	3,000–4,500	6,000–9,000

Butane Isomerization

Isomerization of normal butane to isobutane is a process closely related to alkylation, since it provides a means for augmenting the supply of isobutane where this material is not available in sufficient quantity from natural gasoline or refinery stocks to meet alkylation requirements as determined by olefin availability. The first commercial butane isomerization unit started operation in 1940; by far the major number of units were installed during the period 1941-1945.

Figure II, presents calculated costs of isobutane as a function of plant capacity and normal butane charge cost. These figures are averages of typical isomerization plant costs and should not be construed as rigorous nor necessarily applicable to any particular process or installation. However, they indicate generally the economics of the process. For example, refiners contemplating the operation of alkylation plants for the production of motor gasoline components, and faced with a shortage of isobutane, could produce isobutane from available normal butane in field and refinery stocks at the following approximate costs: (See next page.)

Referring to Figure I for alkylate gasoline costs, it will be noted that each 1.0¢ per gallon increase in charge stock cost raises the alkylate product cost about 1.25¢ per gallon. If alkylation plant olefin charge and normal butane are both available at 2.0¢ per gallon, the isobutane produced by isomerization for reaction (with olefin to form alkylate) will cost 2.6-4.0¢ per gallon and the average charge to the alkylation plant will cost 2.3-3.0¢ per gallon (on the approximate basis of equal volumes of isobutane and olefin reacting). The alkylate gasoline will, therefore, cost 0.38-1.25¢ per galon more than if 2.0¢ per gallon isobutane were avilable from field sources or cracking.

From the above it appears that butane isomerization is a marginal operation, and its applicability a function of isomerization and alkylation plant capacities, extent of amortization of each, cost of field or refinery butane as related to fuel gas and liquefied petroleum gas

Direct Costs	
Labor	
Operating Labor	1.30/man-hour
Direct Supervision	25% of operating labor
Maintenance	3-5% of plant investment per year
Utilities	
Steam (high pressure)	$0.18/1000 pounds
Steam (exhaust)	$0.08/1000 pounds
Power	$0.005/kw
Fuel	$0.13/Million BTU
Cooling Water	$0.005/1000 gallons
Treated Water	$0.05/1000 pounds
Chemicals	Market or manufacturers' prices
Royalties	Estimated licensors' "running" basis
Indirect Costs	
Depreciation	20% of plant investment per year
Charge Costs and Products Values	
Propane-Propene	2-6c/gallon
Butane-Butene	2-6c/gallon
Pentane-Pentene	2-6c/gallon
Virgin Gas Oil	$1.25/barrel
Catalytically Cracked Gas Oil	$ .90/barrel
Housebrand Gasoline (79 ASTM octane)	6c/gallon
Premium Gasoline (86 ASTM octane)	7-7½c/gallon
Tetraethyl lead (including leading cost)	$0.002/cc

	Alkylate Cost-Cents per Gallon	
	Small Refiner (5,000 BPD ± Crude 500 BPD ± Alkylate)	**Large Refiner (30,000 BPD ± Crude 2,500 BPD ± Alkylate)**
Direct Cost	3.3	2.6
Direct Cost plus Depreciation (@20%)	4.9	3.8
Direct Cost plus Depreciation plus charge (@2c per gallon)	7.4	6.3
Direct Cost plus Depreciation plus charge (@4c per gallon)	9.9	8.8
Direct Cost plus Depreciation plus charge (@6c per gallon)	12.4	11.3

market prices, and outlet for alkylate (in aviation, premium, or regular grade motor gasolines) and hence value of alkylate.

Pentane Isomerization

Commercial isomerization of normal pentane to produce isopentane is truly a war-time process; the first unit starting operation in 1944. (16).

Figure III presents calculated economics for the process. As in the case of butane isomerization, there are a number of processes available, each with characteristic features and economics so that the cost information of Figure III is necessarily a rough average only, and not necessarily applicable to any particular process or refinery situation.

Figure III indicates refiners processing about 5,000 BPD and 30,000 BPD of crude oil respectively can produce isopentane at the following approximate costs:

	Isobutane Cost-Cents per Gallon	
	Small Refiner (5,000 B/D ± Crude 300 B/D ± Isomerization)	**Large Refiner (30,000 B/D ± Crude 1,500 B/D ± Isomerization)**
Direct Cost	1.0	0.3
Direct Cost plus Depreciation (at 20%)	2.0	0.6
irect Cost plus Depreciation plus Charge (@ 2c/Gallon)	4.0	2.6
Direct Cost plus Depreciation plus Charge (@ 4c/Gallon)	6.0	4.6
Direct Cost plus Depreciation plus Charge (@ 6c/Gallon)	8.0	6.6

With 79 ASTM housebrand gasoline at a refinery net-back of 6.0¢ per gallon and normal pentane charged to the process at a value of 5.7-5.9¢ per gallon (account lead penalty) a large refiner can consider pentane isomerization since isopentane can be produced at a cost including depreciation, in the neighborhood of 6.9¢ per gallon, which is about the calculated refinery net-back for 6¢ regular grade gasoline plus lead credit for the high-octane of isopentane. In a typical premium blend the normal pentane is worth about 6.4-6.6¢ per gallon, the resultant isopentane costs about 7.6¢ per gallon, is worth about 7.9¢ per gallon, and the economics are more favorable.

The above figures are altered when including a penalty for vapor pressure. For example, normal pentane and isopentane have vapor pressures of 15.5 psi and 21.0 psi, respectively. Each volume of normal pentane can, therefore, carry about .15 volumes of normal butane and the mixture have a vapor pressure of 21.0 psi. The isopentane product therefore carries a penalty 0.3-0.6¢ per gallon (depending on butane value) for volume reduction in "gasoline-plus-butane" that can be made without exceeding vapor pressure specifications. On this basis the isomerization process can be operated with about a 5-year write-off if plant capacity and production are of the order of 1200 B/D, corresponding to a 20,000-30,000 B/D refinery as defined in this paper. Detailed studies of each individual case must, of course, be made. The same general concepts apply to isomerization of heavier components such as hexanes and heptanes. While commercial operation of the latter process has not been as extensive as have butane and pentane isomerization, it is possible that future developments will prove that these are economical methods for octane improvement.

It should be noted in this connection that at the present time all of the isomerization processes require relatively pure charge stocks and the cost of preparation of same has not been included in the cost of Figure III. Thus, it is not pos-

	Isopentane Cost-Cents per Gallon	
	Small Refiner (5,000 B/D± Crude 200 B/D± Isomerization)	Large Refiner (30,000 B/D± Crude 1,000 B/D± Isomerization)
Direct Cost (less small by-product credit)	1.6	0.75
Direct Cost plus Depreciation (at 20%)	2.6	1.15
Direct Cost plus Depreciation plus Charge (@ 2c/gallon)	4.6	3.15
Direct Cost plus Depreciation plus Charge (@ 4c/gallon)	6.6	5.15
Direct Cost plus Depreciation plus Charge (@ 6c/gallon)	8.6	7.15

sible for a refinery to charge a cracked C_5 fraction containing isopentane, normal pentane and pentenes. Normal pentane and isopentane can be charged together, but the C_5 fraction from cracking operations must be processed, as in an alkylation plant, to remove the olefins prior to isomerization. The economics of pentane isomerization are, therefore, closely related to the overall economics of the particular refiner, including his alkylation plant capacity and the cost of operation at various production rates.

Isomerization of pentane, hexane, and heptane as an adjunct to natural gasoline processing appears to warrant consideration provided sufficient charge stock is available at a central point. Thus, if normal pentane is present in natural gasoline to the extent of 15%, and a 1000 B/D pentane isomerization plant is considered as an economic minimum, the isomerization process would be applicable to a natural gasoline plant handling some 280,000 gallons/day of casinghead.

Catalytic Cracking

Catalytic cracking, of which about 1,000,000 barrels per day potential charge capacity was installed during the war represents the major industry investment, and the prime factor is determining industry-wide average octane rating of motor gasolines because of the relatively high ratio of catalytic cracking capacity to crude oil distillation capacity. As is well known from published information on the various catalytic cracking processes, each has characteristic technological and operating features which show up in product yields and qualities, investment costs, and operating costs. Furthermore, economics of catalytic cracking are, of course, related not only to size of installation, but to type of charge stocks available, number and quality of products other than motor gasoline that it is desired to produce, availability of means (such as alkylation or polymerization) for utilizing light fractions (gas, propene-propane, butene-butane, etc.) refinery utility balances and costs, market demand and prices for gasoline, distillate, and residual products, and competitive gasoline quality level. (17).

In a general paper of this type, it is not the intention to cover all the above points, but rather to illustrate the general economic applicability of catalytic cracking. Using typical data for recycle cracking California stock (50-60% yield, Figure IV has been prepared to show the calculated cost of catalytically cracked gasoline as a function of reactor fresh feed capacity and throughout. The following basis for charge and credits was used:

Gas Oil Charge .....$1.25 per Bbl.
Catalytic Fuel Oil....$.90 per Bbl.
Butanes..$.84 per Bbl. (2¢ per gal.)
Dry Gas (C_3 and lighter) .....
.....$.13 per Million BTU's

The following approximate costs for debutanized catalytically cracked gasoline are summarized from Figure IV.

The catalytic cracking operation is shown by the above figures to be attractive, since even when using conservative charge cost and by-product credits, the 78-82 octane catalytic gasoline can be produced at a cost including depreciation below the 6.0¢ per gallon net-back for 79 octane regular gasoline used in this study. Furthermore, the catalytic gasoline can be leaded to 86 ASTM premium grade (at a refinery net-back of 7¢ per gallon) with about 0.6-1.0 cc tetraethyl lead per gallon (raising the gasoline cost only .12-20¢ per gallon) as compared to the maximum of 75-79 octane that can be reached by heavy leading (2-3 cc per gallon) of thermally cracked or reformed stocks.

In addition to the catalytic gasoline, catalytic cracking operation under recycle conditions usually produce C_3 and C_4 cuts rich in unsaturated hydrocarbons, and hence desirable as feed stock to polymerization or alkylation plants. Polymer gasoline (95 ASTM octane blending value) to the extent of 8-12% of the debutanized catalytic gasoline is recoverable by polymerization of C_3 and C_4 unsaturates. As an alternative, alkylation of these olefins can be practiced with considerations discussed in the section on "Alkylation" applying.

Catalytic Polymerization

Although not in a category of a war-time process, a number of catalytic polymerization plants were converted to production of certain essential products during the war period, such as selective polymer

	Gasoline Cost-Cents per Gallon	
	Small Refiner	Large Refiner
Direct Cost	1.1	0.6
Direct Cost Plus Depreciation (at 20%)	2.5	1.3
Direct Cost plus Depreciation plus Charge less by-products credits	5.9	4.4

	Polymer Cost-Cents per Gallon	
	5,000 B/D± Refiner	30,000 B/D± Refiner
Direct Cost	2.1	1.0
Direct Cost plus Depreciation	3.6	1.8
Direct Cost plus Depreciation plus Charge (@ 2c/Gallon)	6.5	4.7
Direct Cost plus Depreciation plus Charge (@ 4c/Gallon)	9.4	7.6

and codimer (for ultimate hydrogenation and inclusion in aviation gasoline as hydrocodimer) and cumene. With the coming of peace, most of the 100 or more catalytic polymerization plants are reverting to their pre-war operation of non-selective polymerization of C_3 and C_4 olefins for motor gasoline production.

Since, as noted above, catalytic polymerization fits in well with most catalytic cracking operations a tabulation of typical calculated costs of butane-free polymer gasoline are presented on previous page.

The above costs include cost of H_2S removal from the charge stock. The charge cost is, of course, variable, depending upon particular refinery stock balances and product market prices.

With tetraethyl lead credit for octane, (0.8-1.0¢ per gallon in typical blends) and with credit for additional butane which can be carried in the gasoline along with the polymer gasoline, polymerization can be considered an economical process, even for the small refiner, with 2¢ per gallon charge stock. With 3¢ per gallon charge stock, the polymer costs about 8.0¢ per gallon and the process becomes marginal in comparison with direct sale of the charge as, say liquefied petroleum gas. Processes such as polyforming and gas reversion are also available for converting these fractions to motor gasoline by thermol means, usually in conjunction with naphtha reforming.

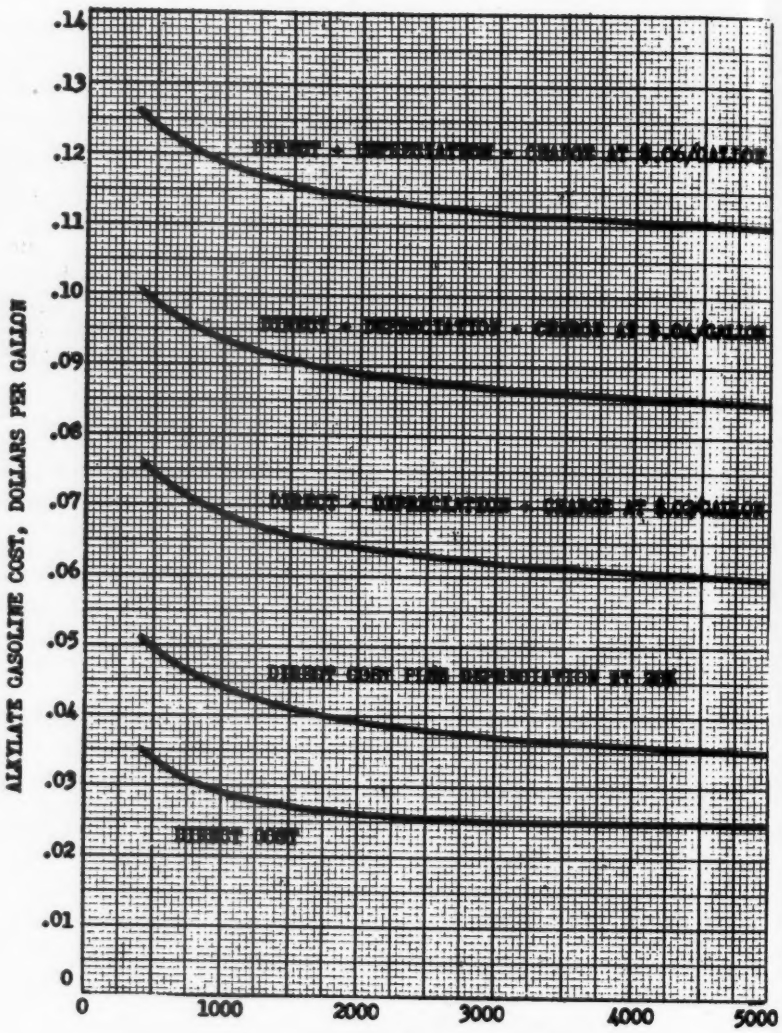
Catalytic Reforming (Hydroforming)

Prior to the war, there were three hydroformer installations, and during the war five additional plants were placed in operation, primarily for the production of toluene. Because of the relatively small number of plants, each more or less of special design, it is difficult to make generalized economic statements regarding the process. However, the following figures are believed representative for a 5000 BPD plant processing low-sulfur virgin naphtha:

Direct Cost of Hydroformed Gasoline .....1.0¢ per gallon
Direct Cost plus Depreciation (@ 20%) .....1.6¢ per gallon

FIGURE I

TYPICAL ALKYLATE GASOLINE COSTS AS A FUNCTION OF PLANT CAPACITY AND CHARGE COST



Direct Cost plus Depreciation plus Charge ($2.10 per barrel) less by-product credits .....
.....7.7¢ per gallon

Considering 76 ASTM octane housebrand gasoline and 86 ASTM octane ethyl gasoline market prices as 6.0¢ per gallon, and 7.0¢ per gallon, respectively, indicates that the hydroforming process can be considered only as marginal with charge stock at 5¢ per gallon (account lead penalty). Certain conditions peculiar to an individual refiner such as low-value charge stock may alter this picture. However, since the economics of the 5000 BPD installation are questionable, it is significant that at the present stage of process development, small-

er units such as those associated with a 5000 BPD refinery would in all probability, be uneconomical. The basic concept of selectivity altering the molecular structure of compounds present in gasoline with high yield is sound, and technological and economic advances can be expected.

Summary

As an indication of the relative utility of the various war-time refining processes in peace-time operation, the following figures, drawn from the above discussion, are pertinent:

1. Assuming pre-war operations involved the production of gasoline from the 31° API L. A. Basin refining crude by distillation, reforming, and cracking, this gasoline might represent about 40% of the crude and consist of the following:

	Vol. %
Light Straight Run	22.4
Reformate	26.2
Cracked Gasoline	46.6
Butanes	5.8

The above blend has a calculated clear ASTM octane of 71.0, and a lead susceptibility such that 79.0 octane is reached with 1.3 cc TEL per gallon.

2. Alkylation of all C_3 and C_4 olefins from reforming and cracking might increase the volume of the gasoline 25% (10% on crude) and increase the clear ASTM octane of the blend about 3.8 points. The incremental gasoline would cost 6.5-7.5¢ per gallon with 2¢ per gallon charge stock.

3. Pentane isomerization would not increase the gasoline yield but would raise the clear ASTM octane of the blend about 2.0 points. The isopentane would cast 7.9-8.4¢ per gallon.

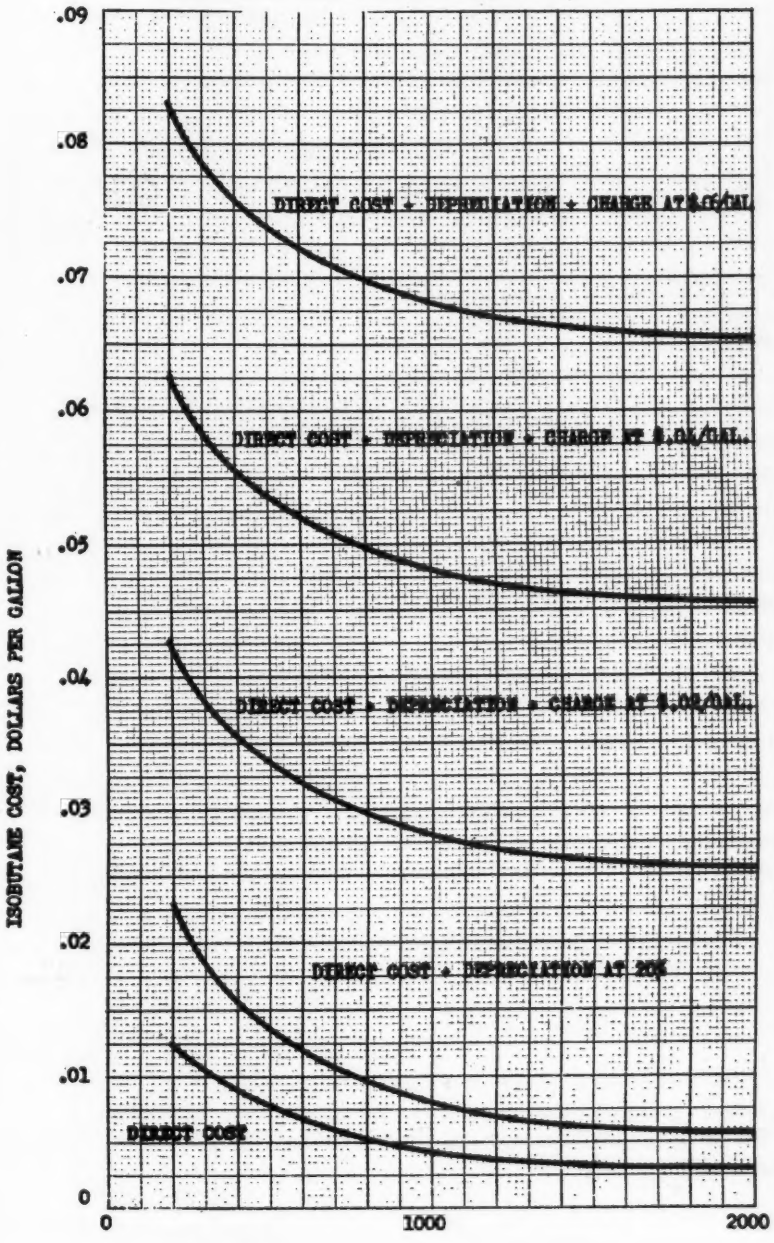
4. Catalytic cracking replacing thermal cracking at no increase in gasoline yield (conservative basis) would increase clear ASTM octane of the gasoline blend about 5.5 points. Designing for maximum yield by catalytic cracking might increase gasoline yield from the refinery 25% (10% on crude) and the clear ASTM octane of the gasoline blend about 6.5 points. The catalytic gasoline would cost 4.4-5.9¢ per gallon.

5. Polymerization of C_3 and C_4 olefins might increase gasoline yield 10% (4% on crude) and increase the clear ASTM octane of the blend about 2.5 points. The poly gasoline would cost 4.7-6.5¢ per gallon with 2¢ per gallon charge stock.

6. Catalytic reforming (Hydroforming) replacing thermal reforming might increase the gasoline yield about 5% (2.0% on crude) and raise the clear ASTM octane of the gasoline blend about 6.0 points. This gasoline would cost 7.7¢ per gallon or more.

FIGURE II

TYPICAL ISOBUTANE COSTS AS A FUNCTION OF ISOMERIZATION PLANT CAPACITY AND CHARGE COST



Conclusions

It should be again emphasized that it is not possible in a paper of this type to draw universally appl-

cable conclusions, and that a process definitely uneconomical for one refiner may be economical for another because of financial, technological, or marketing features peculiar to him. The calculated costs presented to this paper are of necessity based on averaged factors for labor, maintenance, utilities, chemicals, and plant investment; plants designed specifically for individual applications may therefore show costs appreciably different from those presented herein. Furthermore technological advances will certainly improve the economics of all processes which are, by nature, of utility and hence maintained in operation and is a continuous state of development.

Based on the process reviews of this paper and bearing in mind the above qualifications, the following general conclusions can be drawn with regard to the peace-time utility of war-time refining processes

1. The most generally applicable refining tool commercialized during the war is catalytic cracking.

(a) It produces high yields of high octane gasoline (unattainable by thermal reforming or cracking) from low-valued stocks.

(b) It produces relatively high yields of C_3 and C_4 unsaturates which can be processed by alkylation or polymerization to supplement the yield of catalytic gasoline.

(c) While gasoline quality measured by ASTM octane is high, of greater significance is the wide spread between ASTM and Research octane (the latter running 8-12 points above ASTM). This is generally indicative of superior road performance of the fuel, which is the true measure of fuel quality (18) and which is destined to become a prime factor in competitive sales.

(d) Investment and operating costs for small units are not disproportionately high per unit of charge or product.

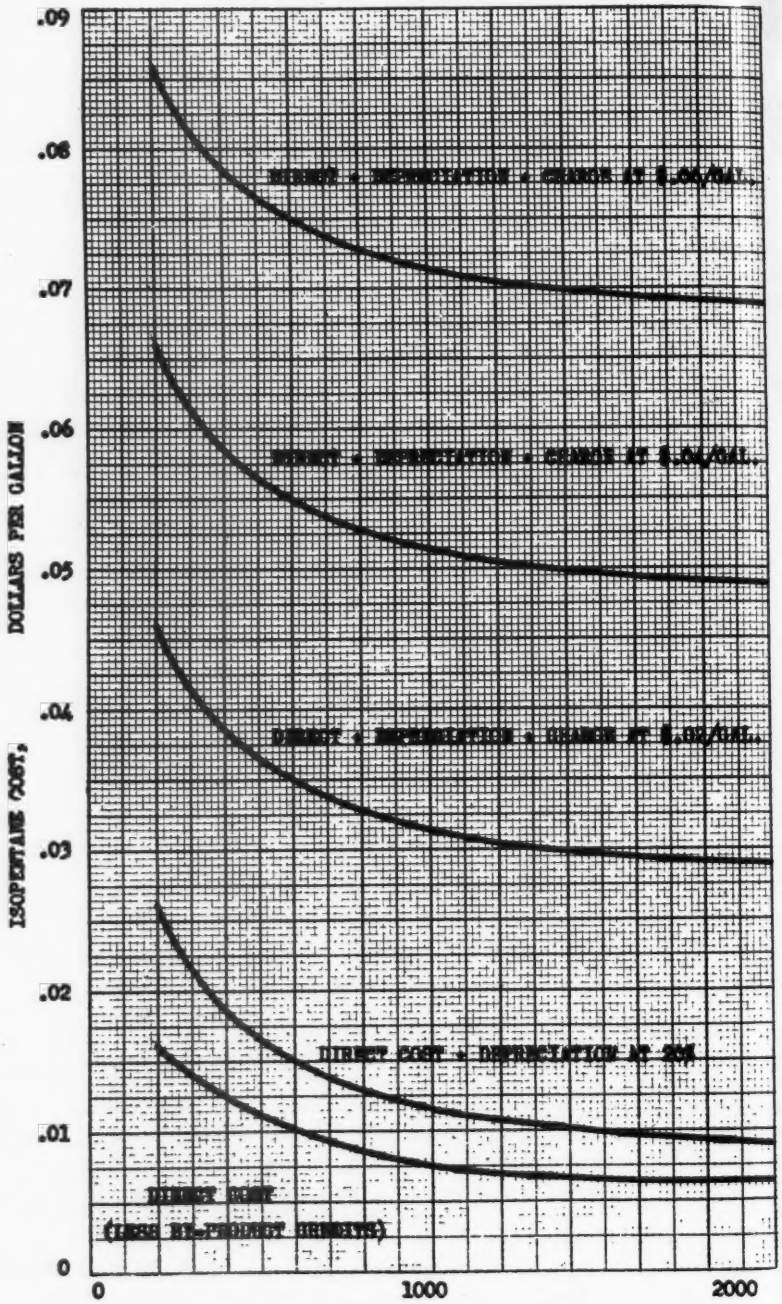
(e) In certain cases, existing thermal cracking furnaces and towers can be utilized, to minimize investment.

2. Thermal or catalytic polymerization of C_3 and C_4 unsaturates otherwise disposed of to fuel gas or low-priced liquefied petroleum gas is, as before the war, an economical operation for virtually all refiners conducting cracking operations.

3. Alkylation of C_3 and C_4 unsaturates and isobutane to the extent that they are available in excess of specification vapor pressure gasoline (and hence disposed of to low-priced fuel gas) is economical for large refiners and marginal for small refiners. Alkylation of materials

FIGURE III

TYPICAL ISOPENTANE COSTS
AS A FUNCTION OF
PLANT CAPACITY AND CHARGE COST



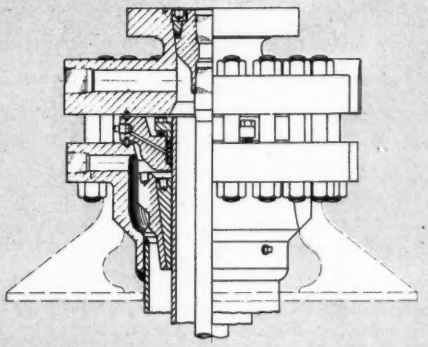
Baash-Ross News

BAASH-ROSS TOOL COMPANY · LOS ANGELES · HOUSTON · NEW YORK

OUR 25th YEAR

WIDE-RANGE VERSATILITY

...one of six* casing head problems solved by Baash-Ross!



WHEN YOU USE BAASH-ROSS HEADS YOU CAN:

1. **Start your drilling program** with a standard base member on your surface string and later—after drilling has shown what your well conditions are—select either welded or slip type casing suspension ... whichever best meets your needs. *Both* types use the *same* base members!

2. **Add or delete strings** from your anticipated casing program as unforeseen conditions develop. This enables you to meet any emergencies.

3. **Change your type** of tubing suspension at any time without necessitating any other changes in the well-head hook-up. This is possible because Baash-Ross tubing heads of equivalent size and pressure rating have the *same* over-all height regardless of type!

These are typical of the many types of changes you can readily make in your well-head hook-up when you use Baash-Ross equipment ... a versatility that permits *new* standards of production efficiencies and economies!

OPERATORS HAVE ASKED US:

Why can't well-head hook-ups be more versatile in their range of applications? As development of a well progresses, it's often necessary to change things around. We may want to change the casing suspension method ... or add or remove casing strings ... or alter the way the tubing is hung ... or make still other changes necessary for maximum development of the well. We need landing and casing head equipment that permits such changes to be made quickly, easily, inexpensively—without changing the whole head!

You get this versatility in Baash-Ross equipment

With Baash-Ross Well Head Equipment you can start out with any base member desired and choose later whether you want welded or slip suspension. Both suspension methods use the *same* base members. Or you can add extra strings of casing—or take them out ... all with a few simple changes in the same basic head installation. Or you can readily change your tubing suspension method to meet different development conditions without changing the over-all height of the hook-up!

Note at left what this wide-range versatility means in increasing the efficiency and economy of *your* development programs. And versatility is just *one* of SIX major improvements engineered into the new Baash-Ross Casing and Landing Head Equipment. Before purchasing *any* well head equipment it will pay you to investigate the *multiple* savings and advancements you get from Baash-Ross. Call your nearby Baash-Ross representative for detailed data ... or write direct!

*THE OTHER FIVE

PROBLEMS SOLVED BY BAASH-ROSS CASING AND LANDING HEAD EQUIPMENT

CELLAR-SAVING COMPACTNESS
... that cuts over-all height to a minimum without sacrificing strength or safety of assembly!

PERPETUAL PRESSURE CONTROL
... quick plastic pack-off anytime without breaking connections or killing the well!

PRE-TESTED PACK-OFF
... all welds and pack-offs pressure-tested at time of installation to assure tight seal!

QUICK EASY INSTALLATION
... base and casing head unitized, handling of drilling riser simplified—and other features!

COMPLETE INTERCHANGEABILITY
... hook-ups and suspensions readily interchanged. All fittings and dimensions API throughout!

such as pentenes charged in at adjusted gasoline values does not appear justifiable for motor gasoline production but may be economical in large scale operations for production of aviation fuel.

4. Isomerization of normal butane to isobutane for subsequent use in alkylation is justifiable economically only if field or refinery isobutane costs 1-2c per gallon more than normal butane, and alkylate produced therefrom is incremental and hence of low unit cost.

5. Isomerization of normal pentane to isopentane for octane improvement is economical only where suitable normal pentane charge can be easily segregated (as from straight run gasoline) and in relatively large capacity units. This process, together with C_7 and C_8 isomerization appears potentially applicable to large natural gasoline plants, especially if they are operated in conjunction with crude oil refining facilities. Isomerization processes may be of value in the production of special aviation superfuels.

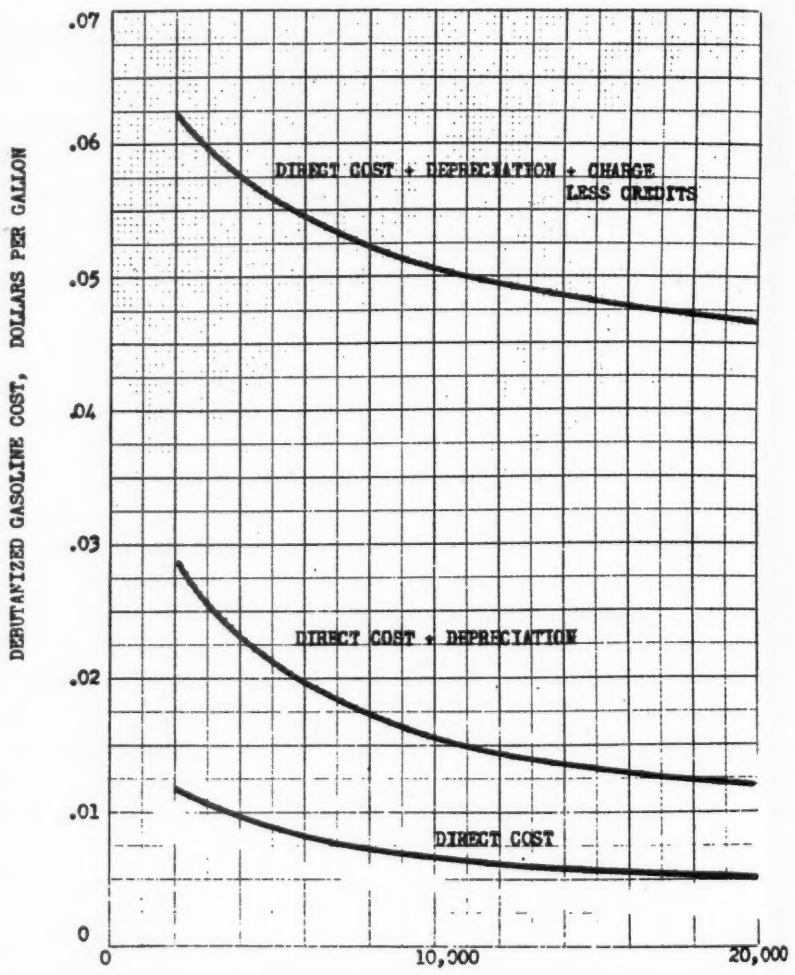
6. Hydroforming, in the present stage of development, does not appear economically justifiable for upgrading octane of naphtha for motor fuel, but may be suitable for certain specialized operations such as aromatic chemical production.

It is certain that the accelerated progress in refining technology made under the pressure of war will continue. Processes developed in the past few years will be further improved while the knowledge and experience gained will lead to new processes. These will benefit all mankind through more efficient utilization of our natural petroleum resources, and the manufacture of products used in industry and commerce, to the ultimate end of reestablishing and maintaining a world at peace.

FIGURE IV

TYPICAL CATALYTICALLY CRACKED GASOLINE COSTS
AS A FUNCTION OF PLANT CAPACITY

BASIS: RECYCLE CRACKING
GAS OIL CHARGE:CALIFORNIA WIDE-BOILING
GAS OIL AT $1.25/BBl.
BUTANE PRODUCT AT $.02/GALLON
DRY GAS (C_3 AND LIGHTER) AT $0.13/MM BTU LHV
CATALYTIC FUEL OIL AT $0.90/BBL.
PRODUCT RECOVERY INCLUDED



Bibliography

(1) Reinhardt; O. and G. J., April 13, 1944, p. 133.

(2) Burrill; A.I.M.E., New York City, February 20-24, 1944.

(3) Risk; National Petroleum News; **36,** R 132-144, 1944.

(4) National Petroleum News; **37,** Section Two, September 5, 1945.

(5) Newton and Shimp; A.I.Ch.E., **41,** 1945, p. 197.

(6) Newton, Dunham, and Simpson; A.I.Ch.E., **41,** 1945 p. 215.

(7) Murphree, Brown, Gohr, Jahnig, Martin, Tyson: A.I.Ch.E., **41,** 1945, p.19.

(8) Buell and Waddill, Refiner, **23,** October, 1944, p.363.

(9a) Chem. and Met., June, 1945. p. 117.

(9b) O. and G.J., March 31, 1945, p. 183-185.

(10a) Evering, Fragen, and Weems; Refiner, **23,** November, 1944, p. 99.

(10b) O. and G.J., March 31, 1945, p. 196-198.

(11) Smith and Moore; Chem. and Met., April, 1941, p. 77.

(12) Lake; A.I.Ch.E., **41,** 1945, p.327.

(13) Parker and Ragatz; National Petroleum News, Feb. 2, 1944, p. R-68.

(14) O. & G.J., March 31, 1945, p.296.

(15) Mendius, Refiner, **24,** June, 1945.

(16) Galstaun; Chem. and Met., **52,** Sept., 1945, p. 109.

(17) Noll and Bowles; National Petroleum News, Oct. 3, 1945, p. R-767.

(18) Jordan, Refiner, **24,** Sept. 1945, p.97.

Commercial Synthesis of Toluene by Hydroforming and Recovery by Azeotropic Distillation

By Fred L. Hartley
Union Oil Company of California

Introduction

Prior to the entrance of the United States in World War II, nitration grade toluene for the production of T.N.T. was obtained in relatively small quantities from numerous coke oven operations throughout the country. Because this production was a by-product related to the mining and utilization of coal, it was impossible to economically and quickly increase the quantity of toluene from this source. To bridge the gap between a supply of 28,000,000 gallons per year and a demand of over 200,000,000 gallons per year, the hydroforming process[1] developed in peacetime for the desulfurization and octane improvement of motor gasolines was immediately available for the job of producing toluene from selected petroleum fractions. Therefore, at the request of Army Ordnance the petroleum industry undertook to supply the bulk of the nation's wartime toluene. By late 1942 the terminology of gallons per day per coke oven plant had been changed to the more familiar refinery expression of barrels per day per toluene unit.

At Union Oil Company's Oleum Refinery a Hydroforming Unit for the treating of motor gasoline was put into initial operation in the Fall of 1941. Concurrent with the design and erection of the commercial hydroformer, the Research Department of Union Oil Company was investigating azeotropic distillation[2] and in particular its application to the recovery and purification of toluene from hydrocarbon fractions produced by hydroforming. By January, 1942 ground was broken for a plant to recover toluene from hydroformate. By January, 1943 the plant was in operation and shortly thereafter was producing 600 barrels per day of nitration grade toluene.

Feed Stock for Synthesis of Toluene by Hydroforming

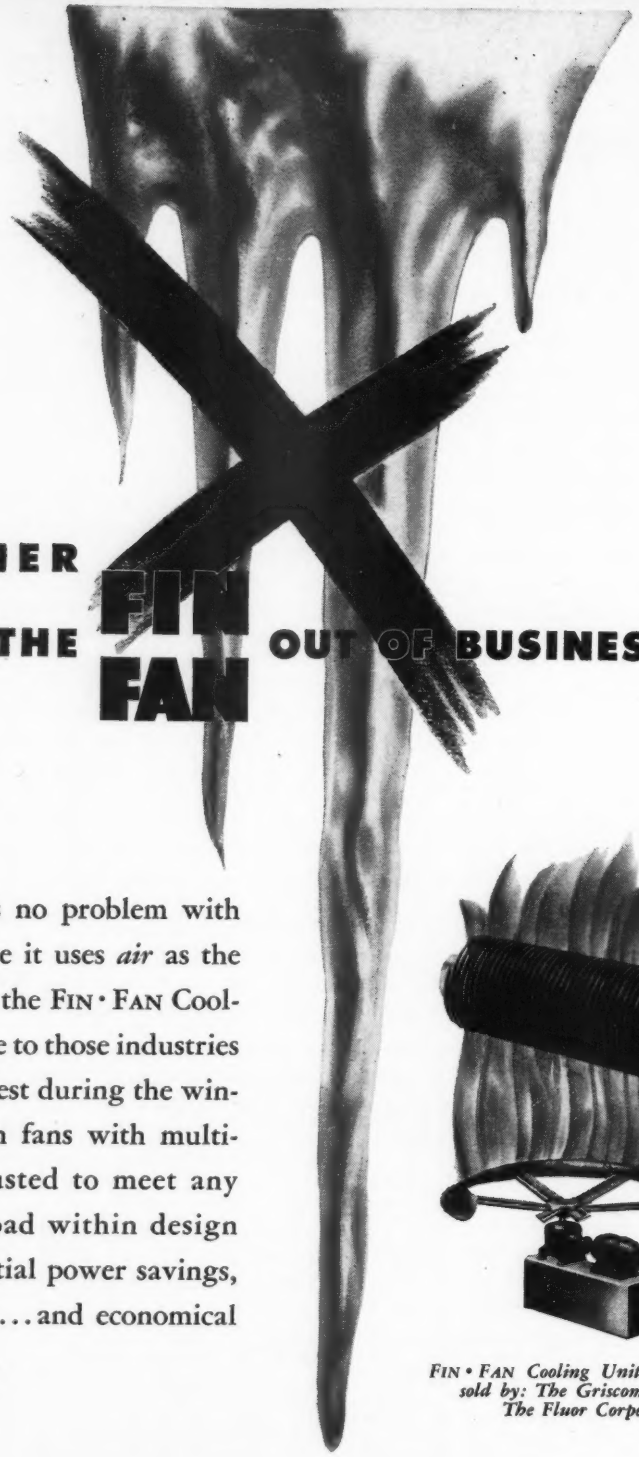
Figure 1 shows the structural formula, boiling point, and gravity of the hydrocarbons associated with toluene synthesis and recovery. Dimethylcyclopentane, methylcyclohexane, and ethylcyclopentane are the three chief "synthesis compounds" from which toluene can be synthesized in a hydroformer. Dimethylcyclopentane and ethylcyclopentane are five carbon ring naphthenes which are first isomerized to methylcyclohexane, a six carbon ring naphthene, and then dehydrogenated to toluene. Toluene is made up of the six carbon benzene ring with one of the hydrogens replaced by a methyl group. Going from the naphthene to the aromatic in the same boiling range, there is a decrease in gravity of between 25° and 40° API. This change in gravity is sometimes used analytically to determine the approximate toluene content of a given sample. Normal heptane and dimethylhexane are two typical paraffin hydrocarbons contained in the feed stock along with the previously mentioned reactants. These compounds pass through the hydroformer reactor essentially unchanged and consequently contaminate the raw synthetic toluene hydroformate. To remove these paraffins in the toluene recovery step, the azeotrope-former methyl ethyl ketone-water is used. This compound, an oxygenated derivative of butane, boils at 175°F, considerably below that of the paraffins and toluene in the hydroformate. The constant boiling mixture (164°F), approximately 90% MEK, 10% H_2O, has the property of loosely combining and lowering the boiling point of the paraffins and naphthenes contained in the hydroformate and at the same time not affecting the aromatic toluene.

All of the hydrocarbons shown in Figure 1 except MEK are contained in California crude oil and natural gasoline. Figure 2 illustrates the volume of DMCP, MCH, ECP, and toluene present in Los Angeles Basin crude. The synthesis hydrocarbons total 1.45% of the crude, and naturally occurring toluene is equal to .56% of the crude. Also shown on Figure 2 are typical analyses of 400° E.P. L. A. Basin straight run gasoline and 9½ lb. Reid vapor pressure L. A. Basin

HYDROCARBONS ASSOCIATED WITH TOLUENE SYNTHESIS & RECOVERY

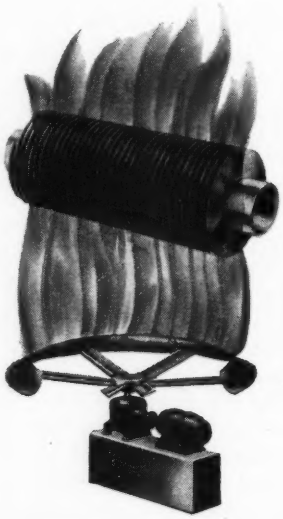
MEK, $CH_3COC_2H_5$ METHYL-ETHYL KETONE	DMCP, $C_5H_8(CH_3)_2$ 1,3 DIMETHYL-CYCLOPENTANE	DMCP, $C_5H_8(CH_3)_2$ 1,2 DIMETHYL-CYCLOPENTANE	C_7H_{16} n-HEPTANE
°A.P.I., 44.3 B.PT., 175°F.	°A.P.I., 58.5 B.PT., 195°F.	°A.P.I., 56.7 B.PT., 197°F.	°A.P.I., 75.4 B.PT., 209°F.
MCH, $C_6H_{11}CH_3$ METHYL CYCLOHEXANE	ECP, $C_5H_9C_2H_5$ ETHYL CYCLOPENTANE	$C_6H_{12}(CH_3)_2$ 2.5 DIMETHYL-HEXANE	C_7H_8 TOLUENE
°A.P.I., 52.4 B.PT., 214°F	°A.P.I., 53.1 B.PT., 217°F	°A.P.I., 72.4 B.PT., 229°F	°A.P.I., 31.7 B.PT., 232°F

Figure 1



COLD WEATHER DOESN'T PUT THE FIN FAN OUT OF BUSINESS

Sub-zero weather presents no problem with FIN · FAN operation because it uses *air* as the cooling agent. This makes the FIN · FAN Cooling Unit of particular value to those industries whose heat loads are heaviest during the winter months. Variable pitch fans with multi-speed drives can be adjusted to meet any changes in weather or load within design limits. This means substantial power savings, especially in cold weather... and economical operation the year 'round.



FIN • FAN Cooling Units are produced and sold by: The Griscom-Russell Co. and The Fluor Corporation, Ltd.

BE SURE SINCE 1890 WITH FLUOR

FLUOR

ENGINEERS • MANUFACTURERS • CONSTRUCTORS

PROCESS PLANTS AND EQUIPMENT FOR THE OIL, GAS AND ALLIED INDUSTRIES

THE FLUOR CORPORATION, LTD., 2500 S. Atlantic Blvd., LOS ANGELES 22 • New York, Pittsburgh, Kansas City, Houston, Tulsa, Boston

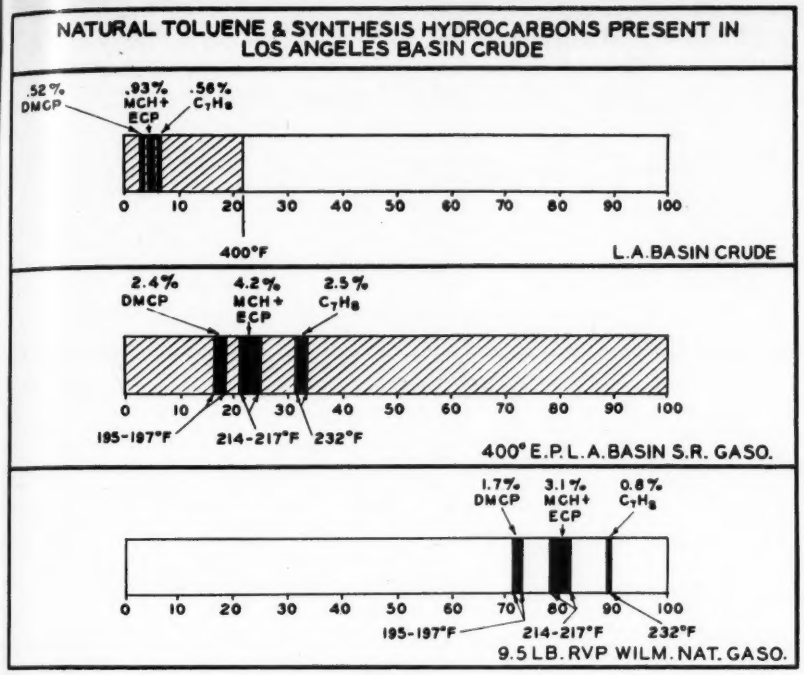


Figure 2

natural gasoline. It can be seen that, in order to include both the synthesis compounds and naturally occurring toluene in the feed stock, a fraction containing everything boiling between about 190°F and 235°F must be separated from both the straight run and natural gasoline. At Union's Los Angeles Refinery this was accomplished by first taking overhead in a crude tower everything boiling to about 235°-240°F and then redistilling this fraction in a 30 plate tower, taking overhead everything boiling below 190°-195° F, and thus removing from the bottom a fraction boiling between 190° and 240°F ASTM which on a TBP distillation boils between 160° and 280°F. This operation, commonly called heart cutting, was also carried out at Union's Oleum Refinery in order to make available the maximum volume of hydroformer feed stock obtainable from total crude and natural gasoline runs by the Company.

In operating a heart cut tower, it is not possible to set up tower temperature controls accurately by means of simple Engler distillations, because the paraffin-naphthenic type hydrocarbons have in themselves an azeotropic effect to aromatics. The boiling point of toluene is suppressed. By means of true boiling point distillations carried out in high temperature Pod apparatus followed by ultimate hydrocarbon analysis, it is possible to determine ultimate distillation column controls in order that all of the synthesis compounds and toluene may be recovered and at the same time exclude contamination of fractions boiling above and below the desired fraction.

Referring to Figure 3, we see a typical true boiling point analysis of the hydroformer feed. This fraction includes essentially 100% of the synthesis compounds and toluene occurring in the crude.

The Hydroforming Synthesis

Again referring to Figure 3, we see the change in composition of the hydroformer feed stock after it has been passed through the hydroformer twice. A loss in liquid volume of 40% has occurred. This is because of the reduction in volume caused by the increased gravity of the toluene, large production of gas high in hydrogen content, and coke deposition on the catalyst. Approximately 94% of the synthesis compounds DMCP, MCH, and ECP have disappeared. The toluene content has of course increased at their expense.

The chemical equations for toluene and coke formation are shown in Figure 4. Dimethylcyclopentane or ethylcyclopentane is first isomerized to methylcyclohexane. The isomerized material, along with the methylcyclohexane occurring naturally in the feed stock, loses one of the hydrogen on each of the six carbon atoms making up the naphthenic ring. Upon loss of hydrogen, the unsaturated benzene ring is produced. This reaction results in the production of hydrogen. Some ther-

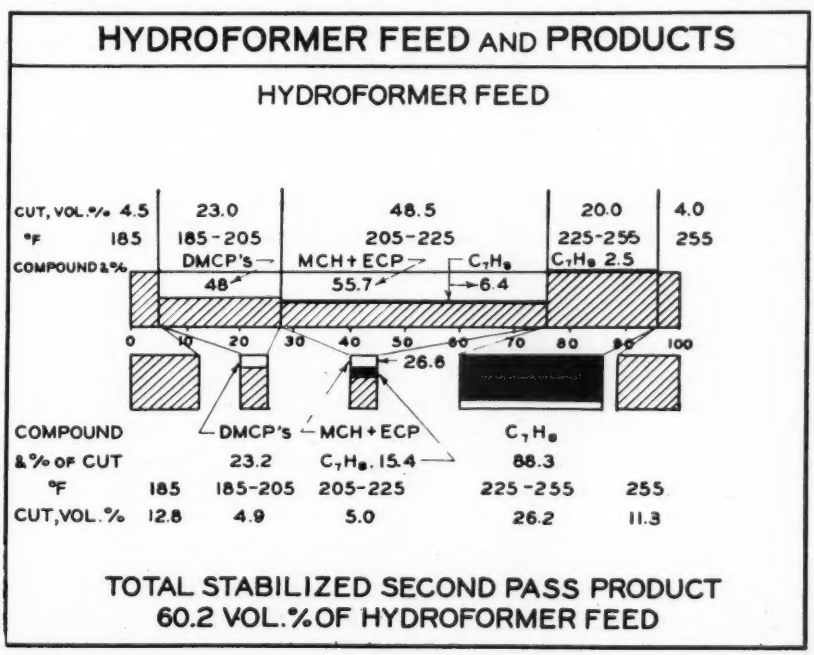

HYDROFORMER FEED AND PRODUCTS
HYDROFORMER FEED
CUT, VOL.% 4.5 23.0 48.5 20.0 4.0
°F 185 185-205 205-225 225-255 255
COMPOUND &% DMCP's MCH+ECP C7H8 C7H8 2.5
48 55.7 6.4
0 10 20 30 40 50 60 70 80 90 100
26.6
COMPOUND DMCP's MCH+ECP C7H8
&% OF CUT 23.2 C7H8. 15.4 88.3
°F 185 185-205 205-225 225-255 255
CUT, VOL.% 12.8 4.9 5.0 26.2 11.3
TOTAL STABILIZED SECOND PASS PRODUCT
60.2 VOL.% OF HYDROFORMER FEED

Figure 3

mal reforming occurs, and consequently in addition to hydrogen the dry gas contains methane, ethane, and propane. Continued dehydrogenation and condensation or polymerization of toluene results in the production of coke. Diagrammatically, this is illustrated by X molecules of toluene condensing to form a very large coke molecule plus additional hydrogen. It is this latter reaction that makes the process for producing toluene by hydroforming so complicated. The coke deposits on the catalyst, deactivating same and necessitating its regeneration.

Synthesis conditions in the commercial hydroformer are as follows:

(1) Reaction pressure of 150-300 lbs.
(2) Reactor charge temperature 1000-1070°F.
(3) Wet gas recirculation (70% hydrogen) 6000 cubic feet per barrel of reactor charge.
(4) Dehydrogenation catalyst consisting of 10% Molybdenum Dioxide on Alumina at a space velocity defined as

$$\frac{\text{Volume of feed/hour/reactor}}{\text{Volume of catalyst in reactor}} = \text{V/V} = .6.$$

The commercial hydroformer is designed to run up to 9000 barrels per stream day of charge stock. Because it is necessary to regenerate the catalyst, multiple reactors are employed, and in the case of Union's hydroformer a total of six are used.

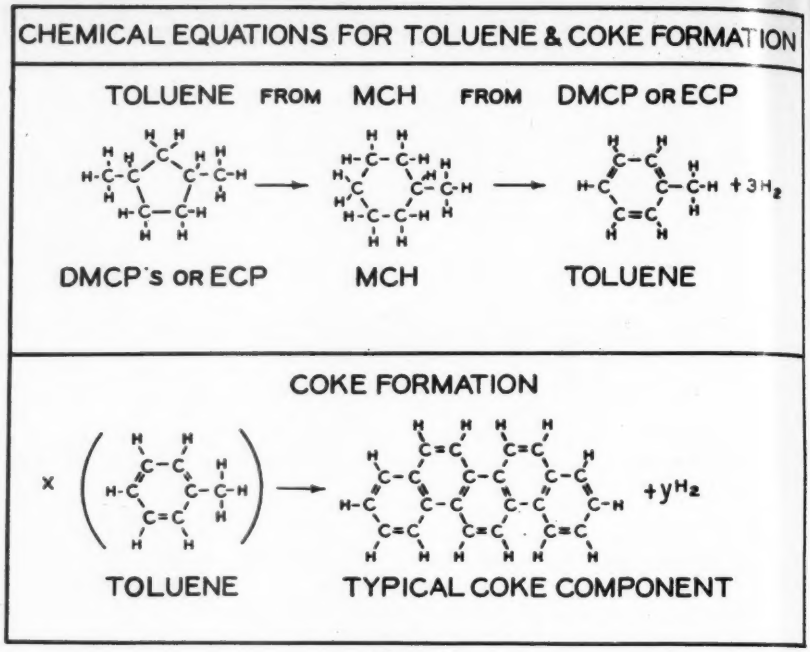


Figure 4

Figure 5 is a diagrammatic flow sheet of the hydroformer. The charge stock enters the plant, is stripped at 170 psig with 150 cubic feet per barrel of recycle hydrocarbon gas to remove traces of oxygen which would otherwise cause exchanger fouling, redistilled to reduce furnace coke deposition, preheated by exchange with reactor product, then heated and totally vaporized at 1050°F, joined with the recycle gas which has been heated to 1070°F, passed through two reactors in parallel with a time contact of about 15 seconds, out of the reactors through heat exchange equipment and into a gas liquid separator. A majority of the separated wet gas, approximately 48,000,000 feet a day, is compressed by three 1000 H.P. gas engine compressors from 75 to 200 psig and recirculated back through the heat exchange equipment, through the heater, and back into the reactor. The purpose of the wet gas recycle is to increase the hydrogen concentration in the reactor in order to reduce coke deposition and thus maintain catalyst activity. The net gas and liquid production passes into a conventional stabilizing and absorption plant to produce fuel gas, 170 E.P. gasoline, and hydroformate. The hydroformate, if first pass (that is, first time through the hydroformer), goes to storage. At about the end of two weeks the first pass production is blocked back through the hydroformer, resulting in the production of second pass hydroformate. The reason for the two pass operation is to obtain maximum conversion to toluene of the synthesis compounds. In Union's particular hydroformer this cannot be accomplished in one step because the heat requirement for

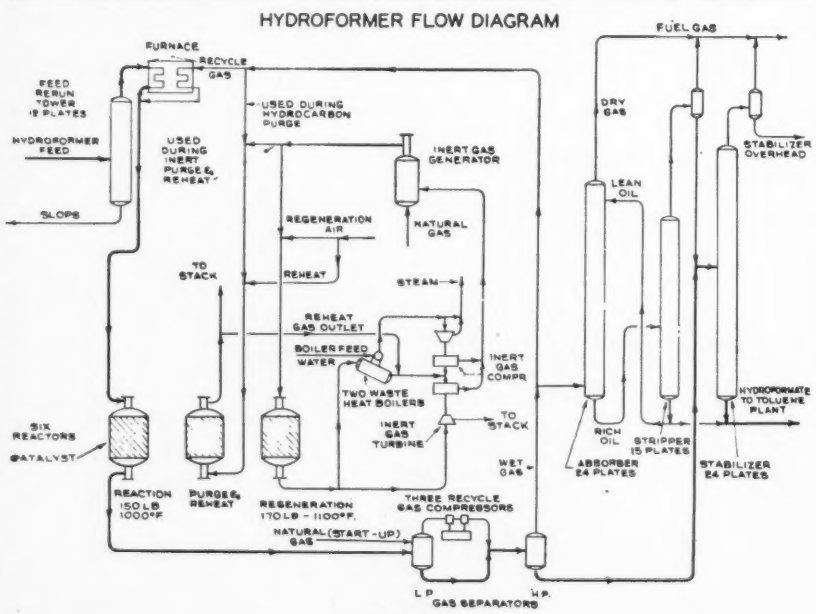


Figure 5

the reaction is so great that a reduction in temperature across the bed of 150°F is experienced. The first pass material is consequently only about one-half converted. On second passing the conversion is essentially completed. While two of the reactors are on reaction, three others are being regenerated. The sixth is either being prepared to go on regeneration or back on to reaction.

After the reaction period, the remaining hydrocarbons are swept out by purging with wet gas production. Following the hydrocarbon purge step the reactor is purged with inert gas. At the end of nine minutes the reactor has been completely purged of vaporizable hydrocarbons and is ready for regeneration.

Regeneration of the coked catalyst is accomplished by bleeding 190 lb. air into an inert gas, essentially N_2 and CO_2, circulating stream. Two 3000 H.P. steam driven reciprocating compressors supply the air. The inert gas at controlled oxygen content of about 1½% passes down through the reactors on regeneration; the oxygen combines with the coke to form carbon dioxide and water; the inert gas removes the heat of combustion and in passing through the catalyst bed is raised from an inlet temperature of 700°F to an outlet of 1100°F.

The hot inert gas circulates through two waste heat boilers from which are generated up to 120,000 lbs. per hour of 450 lb. steam and out of which the 700°F flue gas goes to the suction of two identical 3000 H.P. circulating blowers operating in parallel. The blowers handle a total of 320,000,000 feet of gas per day and compress same from 160 to 180 lbs. The compressed gas returns to the three reactors on regeneration, thus completing the cycle. Make inert gas at 900°F and 150 psig is used to operate a 3000 H.P. inert gas turbine which in turn drives one of the inert gas blowers. The 450 lb. steam production is used to operate a 3000 H.P. steam turbine which in turn drives the other 3000 H.P. blower. Steam leaves this turbine at 150 lbs. and is reused to drive the steam driven air compressors operating at 26" Hg vacuum back pressure.

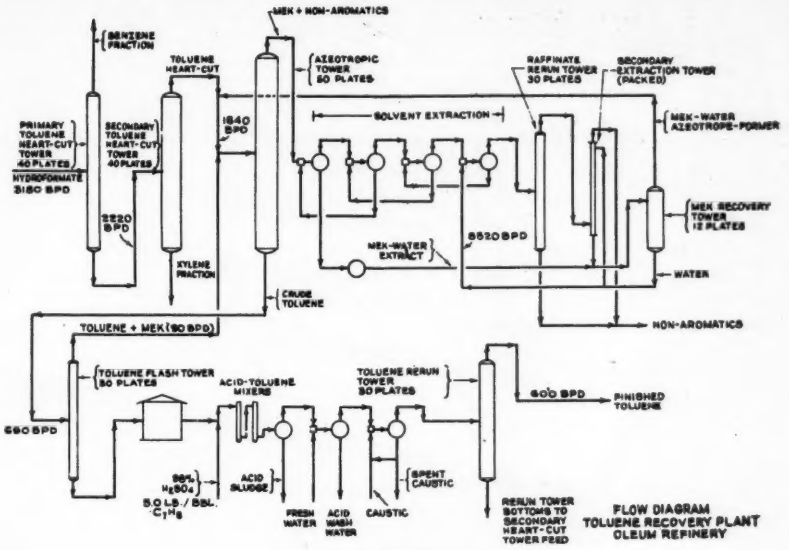


Figure 6

Upon completion of the catalyst regeneration in any one reactor, hot flue gas from one of the other reactors on regeneration flows up-flow through the regenerated reactor, reheating the catalyst bed from about 700° to 900°F. This is called the reheat step, and upon its completion the reactor is depressured to atmospheric pressure and the inert gas removed by purging with wet gas production. During the purge period the hydrogen in the wet gas reduces the Molybdenum from the trioxide MoO_3 to the dioxide MoO_2. The water formed during the reduction is swept out of the reactor. If the purge were conducted at 150 lbs. instead of atmospheric pressure, the water would remain on the catalyst and lower its activity. Upon completion of the hydrocarbon purge the reactor is repressured back to 150 lb. reaction pressure and is then ready to go back on reaction.

The above operations constitute a cycle with an elapsed time of six hours. To synchronize the cycle an automatic cycle controller is employed. This controller sends out

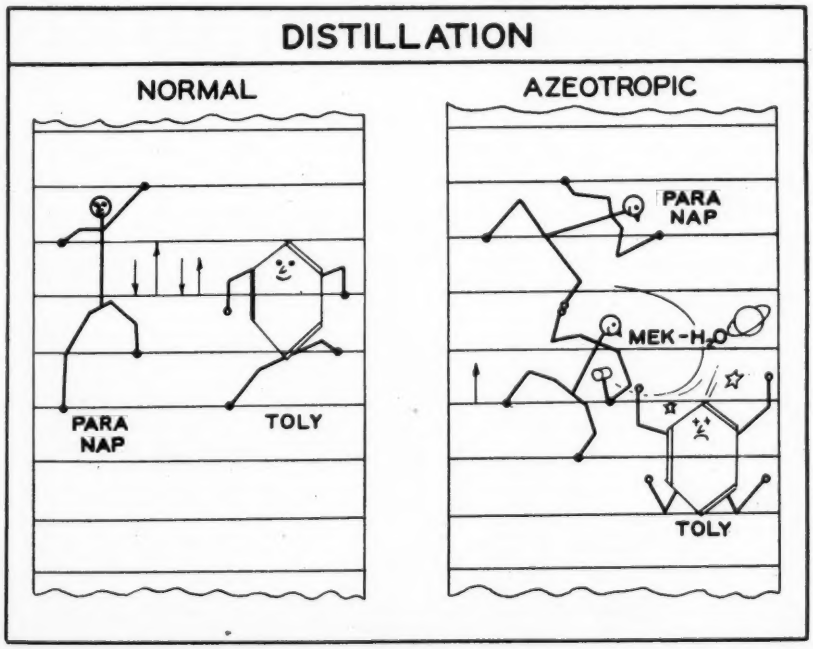


Figure 7

...put your steel problems up to Jorgensen!

Aware of the fact that speed is essential in getting your product to market — Jorgensen's are rapidly increasing their warehouse stocks of steel to take care of your requirements.

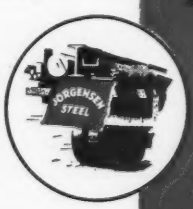
Already stocks include items which have not been available for years — plus many entirely new products. Stocks will continue to increase because a determined effort is being made to build them up as fast as possible.

Jorgensen's warehousing facilities are also being enlarged and improved to handle more steel — faster! That's why — in reconverting — it's a good idea for you to CALL JORGENSEN FIRST!

EARLE M. JORGENSEN CO.

Los Angeles JEfferson 9121 *San Francisco* Enterprise 10942 *Oakland* HIgate 2030 *Houston* Charter 4-1761

Jorgensen carries a complete line of stainless steels, commercial alloy steels, aircraft alloy steels, mild steel, abrasion-resisting steels, cold-finished steels, high-tensile steels, carbon steels, tool steels, mining drill steels, specialty steels, bars, billets, plates, sheets, structurals.



EARLE M. JORGENSEN CO.

STEEL

impulses to electrical relays which in turn actuate electric motors, which in turn operate a total of 52 gate valves. What would otherwise be a batch system is made continuous by means of multiple reactors and the automatic electrical control system.

Toluene Recovery and Purification

Referring to Figure 6, the two pass hydroformate containing about 38% toluene now goes to the toluene recovery plant. Prior to the azeotropic distillation step, the hydroformate is heart cut to form as narrow a boiling range feed stock as is possible in order to reduce the methyl ethyl ketone-water azeotrope-former requirements. This is accomplished by simple fractional distillation in two 40 plate towers, the overhead from the first being a pre-toluene or benzene fraction, from the second the toluene heart cut, and from the bottom of the second a post-toluene or xylene fraction. The toluene heart cut containing about 65% toluene is fed into the azeotropic tower along with the methyl ethyl ketone-water azeotrope-former. In the azeotropic tower the MEK-water mixture loosely associates with the paraffins and naphthenes and carries same overhead. The toluene, because of its higher boiling point, proceeds down the tower from the feed tray and is removed from the bottom as crude toluene. The crude toluene

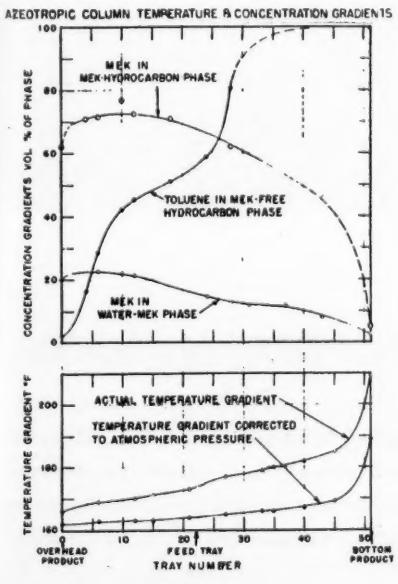


Figure 9

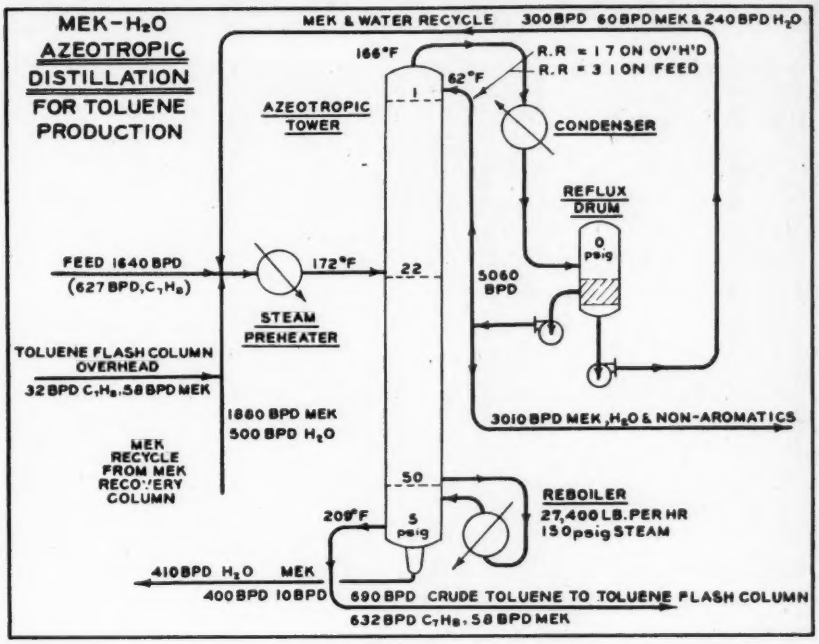


Figure 8

goes to a toluene flash tower from which overhead goes a small cut of toluene plus MEK, and out the bottom leaves an MEK-free crude toluene. The crude toluene is treated with about 5 lbs. per barrel of 98% sulfuric acid, settled, water washed, and caustic washed to remove very small amounts of olefins to obtain color stability. The acid treated toluene is then redistilled to produce overhead finished nitration grade toluene. As an alternate operation one pass hydroformate containing 21% toluene is heart cut to give an azeotropic tower feed containing 39% toluene. Paraffins and naphthenes are removed from this dilute charge stock without difficulty by the MEK-H_2O azeotrope-former.

The methyl ethyl ketone plus non-aromatics taken overhead in the azeotrope tower are contacted with four to six volumes of water counter-currently in four stages. The MEK is preferentially extracted by the water from the non-aromatics and separates out as a separate phase. The extract is fed into a 12 plate MEK recovery tower to produce overhead the MEK-water azeotrope-former plus excess water, and MEK-free water out the bottom. The water cycles back to the MEK extractors. The non-aromatic raffinate from the water extraction is fed into a raffinate rerun tower from which leave at the bottom MEK-free non-aromatics and overhead a small fraction of non-aromatics rich in MEK. This fraction is extracted with water in a small packed tower from which are taken overhead additional non-aromatics and from the bottom an MEK-water extract which also goes to the MEK recovery tower.

The Azeotropic Distillation Process

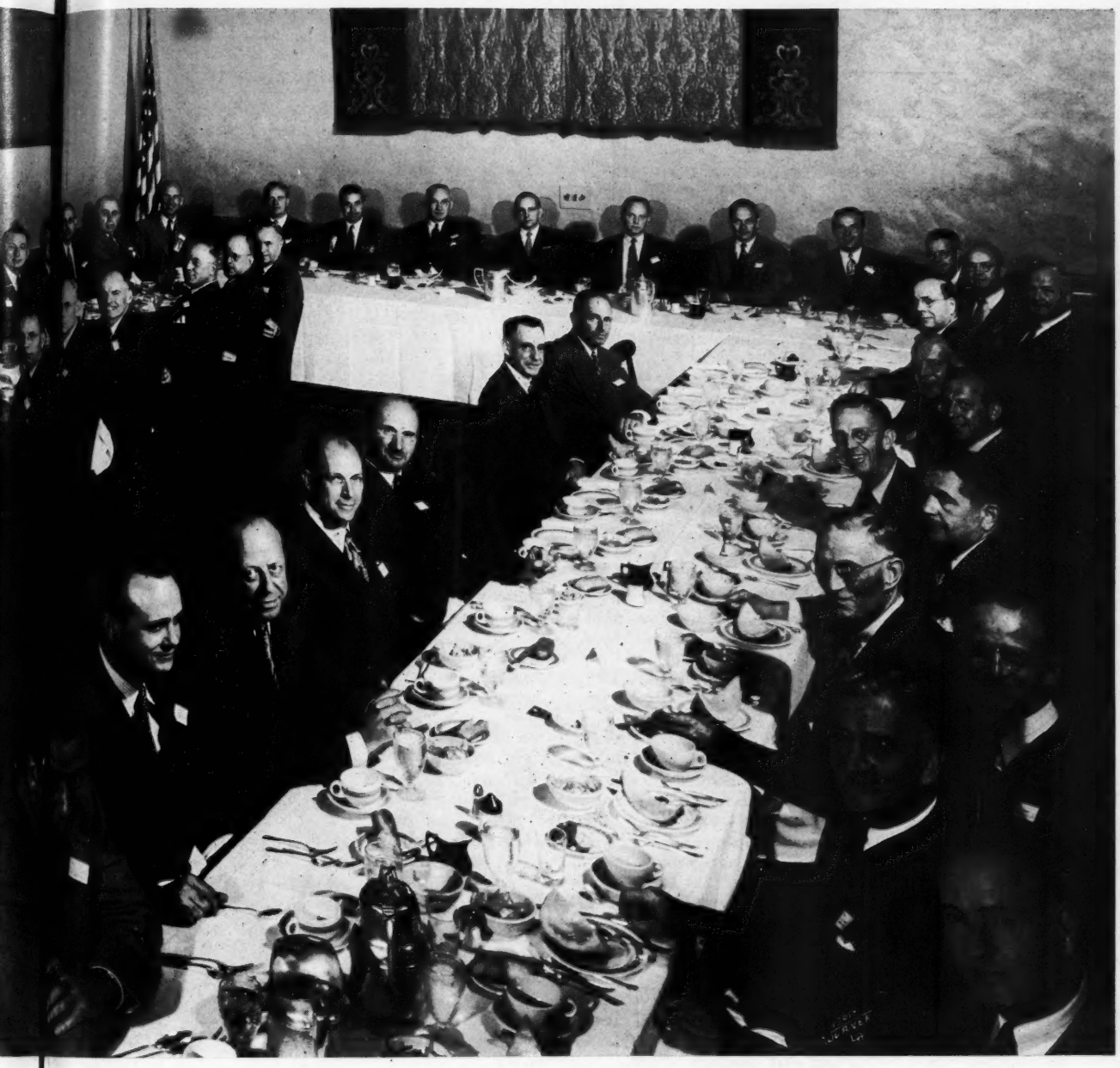
The novel feature of the toluene recovery system is the employment of azeotropic distillation for the separation of two materials of similar boiling point. Referring to Figure 7, the illustration shows what happens when a mixture of paraffins, naphthenes, and toluene is fed into a normal distillation tower. No separation occurs. By adding the MEK-water azeotrope-former along with the feed, a separation becomes possible. MEK-water azeotrope boiling at 164°F associates itself with the paraffin and naphthene hydrocarbons boiling between 175° and 250° F. These non-aromatics are carried up the column and are taken overhead at a top temperature of about 166°F. The toluene which does not associate with the azeotrope-former leaves the bottom of the tower essentially free of non-aromatics.

Referring to Figure 8, the process

(Continued on Page 29)

SPEAKERS LUNCHEON, BILTMORE HOTEL, OCT. 12, 1945, FA

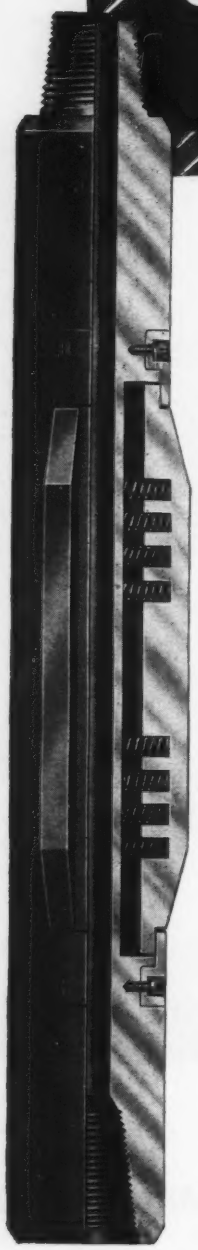
Around outside of table, L to R: J. B. Taylor, E. P. Valby, Coles B. Bason, Earl A. Brock, D. M. Wolfe, F. J. Colton, R. D. Gibbs, I. B. Funk, Wm. Moeller, Jr., W. C. Monroe, W. W. Robinson, Jr., John Rogers, W. L. Rifenberick, Fred Hartley, M. W. Kibre, H. A. Gehres, M. L. Arnold, M. M. Perkins, E. W. McAllister, F. D. Parker, Wm. F. Lowe, C. L. Hutchings, A. R. Chandler, P. S. Magruder,



FALL MEETING, CALIFORNIA NATURAL GASOLINE ASSOCIATION

George Howells, J. S. Fluor, A. H. Bell, R. C. Enderly, D. A. Cushman, A. K. Hegeman, T. L. Taggart, R. S. Tulin. Inside of table, L to R: George Sowards, W. C. Dayhuff, H. P. Saueressig, R. W. Garman, M. L. Fort, H. E. Moulton, C. D. Gard, Harry Ransford, George L. Tyler, H. W. Parmelee, H. L. Eggleston, W. A. Kirk, J. A. Campbell, G. C. McLaren, H. R. Linhoff, P. E. Fluor, R. W. Heath, L. V. Cassaday.

CASING SHOULD BE SCRAPED WHILE THE RIG IS UP



especially when the time comes to "complete" your well with the successful

BAKER

ROTARY CASING SCRAPER

Unless the inside of your casing—the "working surface"—is smooth and clean, there always is danger of encountering difficulties in future down-hole work. The use of a Baker Rotary Casing Scraper eliminates that hazard, for it effectively removes all hardened cement, scale, burrs from gun-shot holes, and other obstructions, leaving the casing smooth and clean to its full I.D.

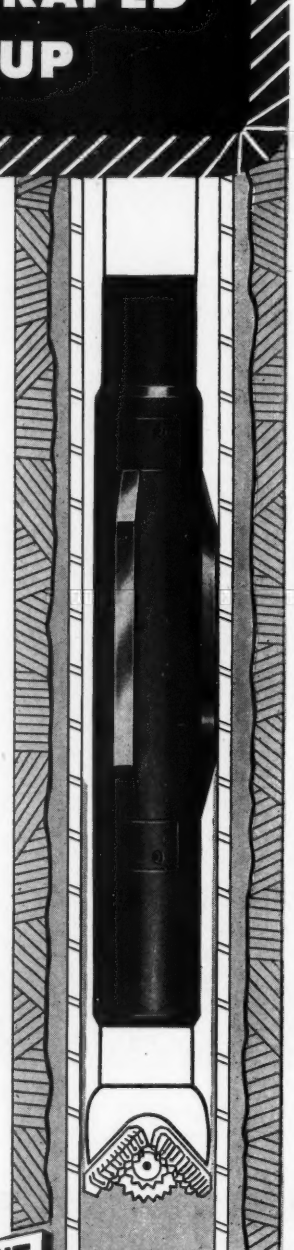
PREVENTS FUTURE DAMAGE TO PACKERS OR SWABS

When casing has been cleaned of all inside obstructions by a Baker Casing Scraper, you *know* that the rubbers on packers and swabs will not be damaged in your future operations—you *know* that no burrs from gun-shot holes remain to interfere with later down-hole work.

TIMING IS IMPORTANT

The time to do a scraping job on your casing is while all equipment is still in position and the crew is on hand. It is then a simple inexpensive matter to include a Baker Rotary Casing Scraper in the string as a "follow-up" behind the bit when drilling out cement. That is the "ounce of prevention" which will leave your casing smooth and clean to its full I. D., and save a "pound of cure" at some future time.

Look on Page 357 of your Baker (or Composite) Catalog, then call the nearest Baker representative for action.



Product No. 620

BAKER OIL TOOLS, INC.

Houston — Los Angeles — New York

YOUR CREWS CAN RUN IT EASILY — SENSIBLE RENTAL RATES

BAKER Rotary Casing Scraper

(Continued from Page 25)

details of the azeotropic distillation tower operation are given. The column itself is a conventional 50 bubble cap tray distillation tower and operates at a bottom pressure of 5 lbs. gauge. The heart cut toluene feed containing 627 barrels of toluene and 1017 barrels of non-aromatics is joined by about 2090 barrels a day of the MEK-water azeotrope-former (90-10) and 290 barrels per day of water recycled from the MEK recovery tower. In addition, 300 barrels per day of water-MEK (80-20), which separates out in the column reflux drum, are recirculated back to the feed tray, plus a recycle of the overhead from the toluene flash column consisting of 32 barrels per day toluene and 58 barrels per day MEK. The ratio of azeotrope-former to non-aromatics is between 2 and 3 to 1, depending on the boiling range and type of non-aromatics present. The combined feed is preheated to 172°F and enters the column on the 22d tray. A reflux rate of 5060 barrels per day corresponding to a cold total reflux to heart cut feed ratio of 3 to 1 is employed to obtain adequate fractionation of the toluene from the non-aromatics and stripping of the non-aromatics from the toluene. Heat is put into the column by means of two parallel steam reboilers. Excess water over that required to form the azeotrope with MEK proceeds down the column and is removed as a separate stream from the bottom of the tower. This stream containing a small amount of MEK is recycled back to the MEK recovery tower.

The column is controlled by fixing all possible variables. Feed rate and reflux are on flow control. Heat input to the reboiler is varied by controlling the quantity of steam by means of a temperature controller set to maintain a predetermined reboiler outlet temperature. This temperature is set to permit about 5% MEK to remain in the toluene product. At this MEK concentration complete removal of non-aromatics from the toluene is assured.

In all respects the column operates like a normal distillation tower. Figure 9 shows the azeotrope column temperature gradient and the analyses of the material on each tray of the column. From these plots we note that the toluene concentration decreases very rapidly in the upper ten trays of the rectifying section and that the bottom fifteen trays of the stripping section are required to obtain complete elimination of the non-aromatics. The MEK concentration remains essentially constant at 70% on the top thirty trays and then decreases in the lower twenty decks to about 5% in the toluene bottoms. Two liquid phases exist on the trays throughout the column, the MEK-water-hydrocarbon phase and the water-MEK phase. Sufficient agitation occurs on the trays so that the normal distillation tray fractionation efficiencies apply.

When the charge stock contains 40% or more aromatics, azeotropic distillation is usually less costly than extractive distillation. An example of this somewhat similar process is the separation of toluene from non-aromatics using phenol as the extractive distillation agent. The chief difference between the two processes is that in azeotroping a majority of the agent goes overhead with the non-aromatics and in extractive distillation a majority of the agent goes out the bottom with the aromatics.

Uses of Azeotropic Distillation

The field of application of the azeotropic distillation process should greatly increase as the petroleum and chemical industries increase their production of more and more essentially pure compounds. Certainly the production of aromatics by azeotropic or extractive distillation will continue. For separating toluene and xylene from non-aromatics, MEK-H_2O azeotropic former can be employed. For separating toluene from non-aromatics methanol can also be used. Acetone can be used as the azeotropic agent for separating benzene from non-aromatics.

Acknowledgment

The author expresses his appreciation to all those giving assistance and in particular to Messrs. George Fekula and Austin McCreery.

---

[1]Developed and licensed by The M. W. Kellogg Company.

[2]Mr. Geo. Lake, June 25, 1945 AICHE Transactions.

Delivered at Fall Meeting, CNGA.

Sawyer Advanced by Byron Jackson

Lynn Sawyer, General Manager of the Pump Division of the Byron Jackson Co., was elected a Vice President of the company at the October meeting of the Board of Directors, according to an announcement made by E. S. Dulin, President.

Lynn Sawyer

Sawyer, formerly Chief Engineer of the Roosevelt Water Conservation District in Southern Arizona, entered the employ of Byron Jackson Co. on June 1, 1929, as a local salesman in the San Francisco Bay area. He was made Manager of the Mid Continent Division at Fort Worth in 1933, Manager of the New York office in 1938, and in November, 1943, was recalled to the head office and promoted to General Manager of the Pump Division. He enjoys an unusually wide acquaintance with pump engineers throughout the United States, Canada, Mexico, and in Europe.

H. C. Smith Opens Casper Office

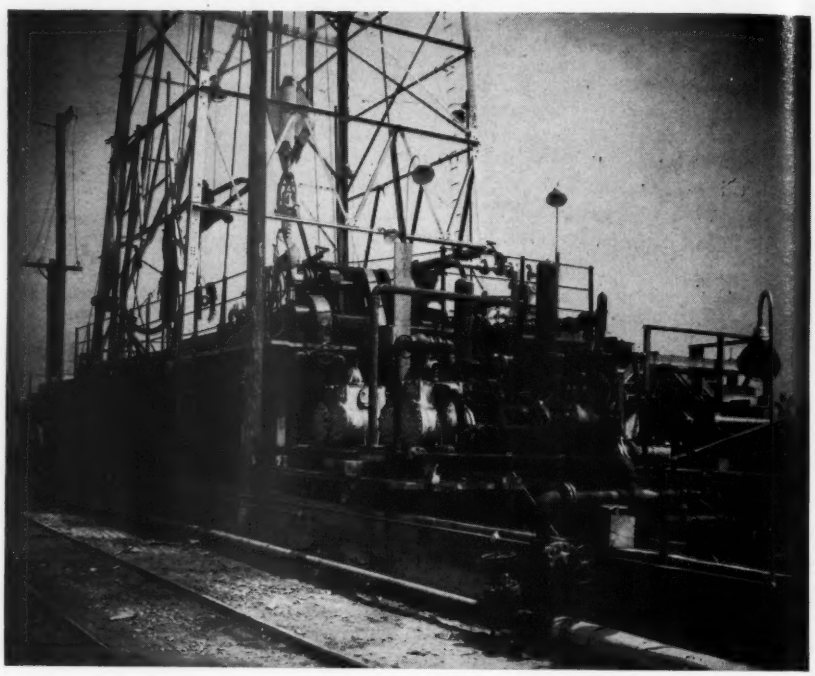
H. C. Smith Oil Tool Co., Compton, California, announce the opening of a branch office in Casper, Wyoming, 328 So. David St. Jack Bush has been appointed branch manager of the new office.

Movable Substructure-Derrick-Rig Assembly Facilitates Directional Drilling Operations

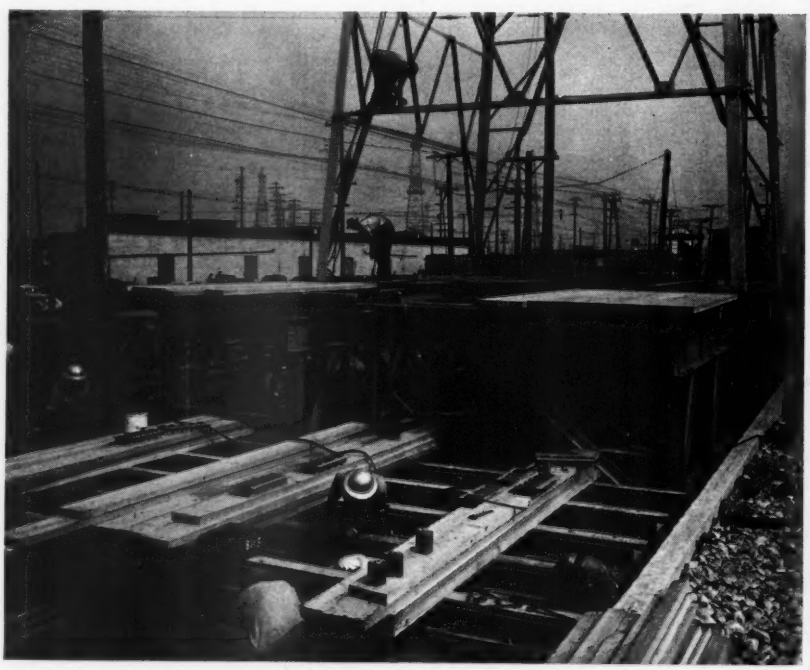
The limitations imposed upon the directional drilling of 60 wells on an operating area 40 feet in width by 1¼ miles in length has led to the design of a well-group foundation and movable substructure which are now being employed on the west bank of the Flood Control Channel in the Long Beach area of the Wilmington field. Resting on the substructure and moving with it is a 24-ft. base derrick. The derrick is of the ordinary 122-ft., 439,000-lb. A.P.I. type but in order to get the height desired an additional 10-ft. section with vertical sides was placed upon it. The 40-ft. width of the operating area at each well location is taken up by the 24-ft. base of the derrick, a 6-ft. wide tool dock and a 10-ft. road.

The foundation units now in use provide for the surface locations of five wells each which will be directionally drilled to position on the productive zone at predetermined locations. As can be seen in the accompanying photographs, the required compactness has been secured with a mobility that gives the operator an attendant reduction in moving and rigging costs. The compactness of the operation also permits one boiler setting which will be used to generate steam for the drilling of approximately 60 wells on the operating area.

It was decided, after much study, to locate well heads at each operating group 18 feet apart so that upon moving the drilling equipment from one well hole to the next, sufficient clearance would be given to the first drilled well to mount the pumping unit. A one-foot wall was provided between the cellars to provide maximum mud sump capacity. Due to the general restrictions of the total surface area involved, the substructure was contemplated as approximately 90 feet long, which included, naming them in their re-



View of substructure showing detail of derrick and draw works installed and mud pumps and shaker screen mounted on portion of substructure.



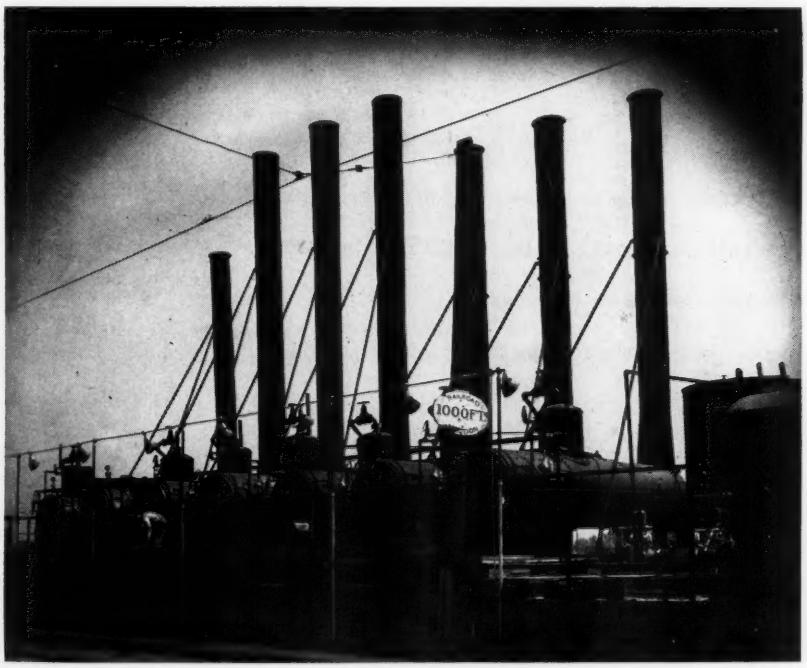
View of substructure construction showing rollers and roller cages ready to be installed.

spective order from one end to the other; mounting and carrier space for two mud pumps and shaker-screen, derrick and draw works, and steel pipe-rack. Weight is distributed on four tracks and the substructure lies upon these tracks on a series of rollers, there being ten rollers to each cage. A high pressure lubrication fitting is introduced into the cage opposite the end of each roller. On the two units built and now in operation, there are 322 such lubrication fittings on each substructure.

Rigging up is done in the conventional manner. The mud lines, steam lines, and water lines are connected by Uni-bolt; all other fittings are solidly welded. Under this system, one rigging-up job is sufficient for an unlimited number of wells, according to the length of the foundation built. Preparation for moving consists of undoing the Unibolts and breaking the tie-downs.

Three moves have been made and were accomplished with two ordinary winch trucks backed up to the end of the foundation. The winch lines were run through a pair of blocks, each with two 8-inch sheaves. Drill pipe, drill collars and kelly were tied back into the corner of the derrick, the drill pipe in trebles. The moves were, of course, 18 feet from well center to well center. The first move was accomplished in 18 minutes, the second in 8 minutes, and the third in 10 minutes, with no swaying or vibration. The total weight of the substructure, pumps, draw works, etc., with the drill pipe, collars and kelly standing, was something over 300 tons.

View of foundation for five wells, showing tracks.



View of permanent boiler plant.

The well from which the derrick is moved is completed with tubing and rods run ready for the pumping unit when the move is made; and 8 hours after, the rig is ready to spud the next well.

The original conception of the entire setup was the work of Robert V. New, President of The Continental Companies, and was designed to operate on the area cited above. It was then passed on to M. L. McGee, General Superintendent, who worked out the details of application to the particular job. The structural detail of the substructure was done by Wm. Tobin, of the Steel Oil Derrick Company.

WE WATCH ALL THE "LITTLE THINGS!"

Big outfits are fine, but sometimes a smaller, closer, and happier group gets more done. Here at Petrol it's easy to talk to anybody, easy to have meetings, easy to get decisions, easy to get on to the next problem. We even have time to watch all the little things that we think are important. In short, the Petrol Family is a closely-knit, efficient, happy group that gets a lot done and gets a big kick out of doing things in a personal way. We think you'll enjoy doing business with us.

THE PETROL CORPORATION

PDQ GASOLINE, OILS, LUBRICANTS, AND RELATED PRODUCTS • STEAM-REFINED AND AIR-BLOWN ASPHALT DERIVATIVES, ROOF SURFACING, WATERPROOFING • PRIMERS AND PAINTS

Follis Heads Standard of Calif.

Standard of California, whose growth of the past dozen years has been on an international scale, last week elected a new president with a record that promises continued expansion.

The new executive is Ralph Gwin Follis, whose services with Standard dates back to school vacation jobs as a rotary helper in the oil fields.

Lean, quiet-spoken and on the baldish side, Follis comes from a family that has had a solid part in California affairs for generations. Only 43, he is one of the youngest men ever to head Standard. Of his qualifications, the retiring president, Harry Deward Collier, who becomes chairman of the board of Standard, declared:

"Particularly during the war he demonstrated such a complete grasp of the Company's problems and its promises for the future as to win the extreme confidence of our entire organization, and to suggest him as the logical man to succeed me in the presidency."

Follis' election further emphasized the oil industry's interest in research as a means to expand its markets by development of new products. He took an important part eighteen months ago in the formation of California Research Corporation, which bound up Standard's research activities into one organization, and he became first chairman of Cal Research's board.

However, he is a many-sided personality and his company experience covers more than the research field. He is accounted by the industry as an outstanding manufacturing executive; as a matter of fact, he started as a permanent employee in 1924 in the engineering department at the company's Richmond (Calif.) refinery. Rounding out his background he worked in refineries at Bakersfield and El Paso. He finished this field training in 1932 and returned to his home office. Eight years later he was made general manager of Standard's manufacturing department.

He became a vice president and member of the board of directors in 1942 and last year he was made an assistant to the president. He has been an active leader in oil industry matters. During the war, much of his time was devoted to the coordination of the oil industry's support for the war effort.

R. G. Follis

Known to his associates as "Gwin," he went one year to the University of California and three years to Princeton, where he graduated with a B.S. degree in physics in 1924.

As to his policies, he does not anticipate any drastic departure from Standard's time-proven program. He explains:

"We'll continue along the same lines we've followed under the guidance of Mr. Collier. In the past four or five years of close association with Mr. Collier, I've been in intimate touch with the sound and constructive policies that have governed the company. They have worked well and certainly bear continuance.

"Plans for modernization of our facilities and expansion of our operations will be carried right along. Our reconversion has speeded along so smoothly that we are ready to take up many long-planned projects."

He pointed out that Standard already is moving ahead on nearly

(Continued on Page 35)

Fall Meeting A. I. M. E. Southern California Section

The American Institute of Mining and Metallurgical Engineers held its annual fall meeting at the Ambassador Hotel, Los Angeles, Friday, October 19. It was a joint meeting of the Industrial Minerals Division and the Petroleum Division.

Separate technical sessions were held all day and climaxed with a joint dinner meeting in the evening to which Mr. Irving Borders, Assistant Regional Manager for the Pacific Southwest Division of the Committee for Economic Development, addressed the engineers on the Problems of Reconversion. Mr. E. O. Slater, President of the Smith-Emery Company, presided at the dinner meeting.

The Industrial Minerals Division program was arranged by Mr. G. A. Jolsin, Consultant, and Mr. E. D. Arthur, Mining Commissioner, Los Angeles Chamber of Commerce. The Petroleum Division program was arranged by Mr. T. A. Atkinson, General Petroleum Corporation.

The meeting was well attended. Approximately 300 technologists from the Pacific Coast mining area were present.

G. C. Pfeffer, M. D. Hughes, E. K. Parks, L. A. Braden.

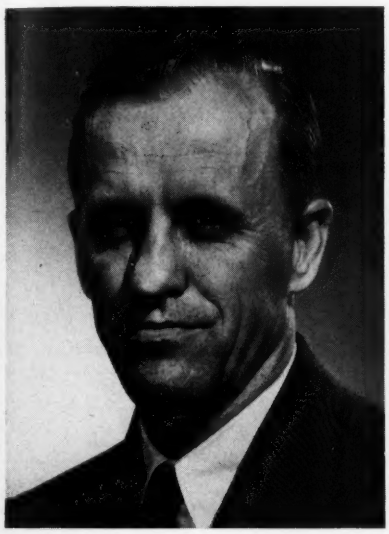
Reception Desk, Grace Elness, Mildred Taylor, Walker Clute, Meitzie Palmer.

Chairmen Afternoon Session, Carlton Beal, C. F. Gates.

E. V. McAllister

Briscoe Advanced by Bethlehem Steel

Bethlehem Steel Company has announced the appointment of Willard S. Briscoe as head of its Publications Division, West Coast. In this capacity, he will be in charge of the Company's press relations in the Pacific Coast area, succeeding M. D. Salisbury.



Willard S. Briscoe

Gordon H. Dent has been named as his assistant. Mr. Dent was formerly a member of the Industrial Relations Department of Bethlehem's San Francisco shipyard.

Mr. Briscoe has spent a large part of his life in the West. He was educated at the Colorado School of Mines.

He was in charge of Bethlehem's exhibit at the San Francisco World's Fair, and later supervised publications and press relations work at Tulsa, Oklahoma.

After the advent of war, he was assigned to the Baltimore District where Bethlehem has three shipyards and a steel plant.

Mr. Briscoe will represent both the steel and shipbuilding operations of the company on the West Coast, having his central office in San Francisco, with offices also at Los Angeles and Seattle.

M. D. Salisbury, who is returning to the general offices of the company at Bethlehem, Pa., will resume his post as head catalog writer for the concern.

Follis Heads Standard

(Continued from Page 33)

$24,000,000 worth of new construction and is spending $13,000,000 to provide itself with the latest in tankers for its world-wide operations.

From his record, Follis can be expected to emphasize manufacturing efficiency and research to expand Standard's markets.

He is one of the numerous group of San Francisco water-lovers that dots the Bay with flocks of sails every sunny Sunday. Pre-war, he owned and sailed his own sloop and he doesn't anticipate that his new executive responsibilities will stand in the way of acquiring another. He admits to golf as a second hobby, but cautiously doesn't identify his ability beyond that he shoots "in the hundreds."

Deeply interested in music, Follis is a regular San Francisco opera goer and he has received wide credit for the success of "The Standard Hour," his company's 18-year-old radio symphony program that is rated as one of the West's outstanding radio offerings.

The Follises have two children, a daughter 14 and a son 12.

MINIATURE "OIL FIELD" FORETELLS FUTURE

Physicist H. G. Botset, of Gulf Oil Corporation's Research Laboratories, plans oil production on the "Electrolytic Model Oil Field" he invented. The device, which duplicates actual oil field operations on a laboratory scale, will substantially increase the world's usable oil resources. The "Model" can foretell results of various production methods in given oil fields up to 20 years in the future, assuring more scientific advance planning and a greater percentage of oil recovery. The young lady assistant holds a tray of miniature "oil wells."

Because of their Better Quality

LUNKENHEIMER VALVES

cost us LESS per Year of Service!

In buying a valve, as in buying anything else, it's *value* you're really after.

What is the measure of valve value? Length of service life, efficiency of performance, time and expense required for maintenance... these are the principal factors.

In these and in all other elements of value, Lunkenheimer Valves have proved their superior worth throughout American industry, in wartime as in peacetime. Maintenance men everywhere rely implicitly on these *better valves* because they know they are *better values—quality-built* in every detail, assuring longer and more efficient service with the very minimum of maintenance trouble and expense.

For Better Valve Values, Specify Lunkenheimer!

THE LUNKENHEIMER CO., Cincinnati 14, Ohio, U. S. A.
Offices: New York 13, Chicago 6, Boston 10, Philadelphia 7.
Export Department: 318-322 Hudson St., New York 13, N. Y.

Your LUNKENHEIMER Distributor

Lunkenheimer Distributors are located in the principal industrial centers. There is one near you fully equipped to assist with your maintenance and operation problems. Call on him.

BRONZE, IRON, STEEL, AND CORROSION RESISTANT ALLOY VALVES—
AIR DEVICES, LUBRICATORS, AIRCRAFT FITTINGS

Carrington King

(Continued from Page 1)

an organization and Ickes, at a recent press conference, declared, as long as the campaign is conducted "outside of government," he thinks the plan is "very well worth considering."

Indicative of the lively interest displayed in the creation of a nation-wide association which would serve as a sounding-board for all branches of the industry and attempt to maintain present sympathetic government-industry relations is the formation of a special PIWC committee that Boyd appointed to study the situation. The committee of 23 industry representatives is expected to report its findings at the final PIWC meeting, December 11.

* * *

After a sphinx-like silence of more than two weeks, Secretary Ickes treated his critics and admirers of the newspaper profession to an old-style press conference at which he agilely ducked questions, wise-cracked with the reporters and discussed his friendship with Thomas G. Corcoran, former New Deal brain-truster and nationally-known lawyer-lobbyist.

Much of the press conference was devoted to the subject of tidelands oil, and it was in connection with this matter that Corcoran's name came up. Asked if he had talked with Corcoran about the tidelands, Ickes said:

"I can't say yes or no. I've talked about a lot of subjects with Tom Corcoran during the last 12-and-a-half years. I am always entertained and edified and frequently instructed."

Reporters could not draw him out, however, on the extent of Corcoran's interest in the pending legislation, although a reporter suggested the Washington lawyer was "on your side of the fence" in the controversy. Ickes contented himself with saying he did not know which side of the fence Corcoran was on, but expressed the "hope" Corcoran sided with him. Neither would he comment when asked if he knew whom Corcoran "represented in the matter,"—except to remark facetiously,

"I thought he represented Tommy Corcoran."

Whether by design or coincidence, Ickes chose the same press conference to air his view on the invalidity of Valentine scrip just two days after City Attorney Irving M. Smith, of Long Beach, publicly charged that official Washington had a hand in the dismissal of a perjury case against an individual who assertedly attempted to gain title to 80 acres of oil-producing land in the Long Beach area through a Valentine scrip filing.

Ickes said there was "not a chance" that anyone could use the scrip in negotiating for oil-bearing lands, reiterating his opinion of 1941 that the scrip is not usable for public lands with a mineral content.

". . . I can assure you that no Valentine scrip, even in the absence of a statutory prohibition, would be accepted for any leasehold having to do with these oil lands off the Pacific," he said.

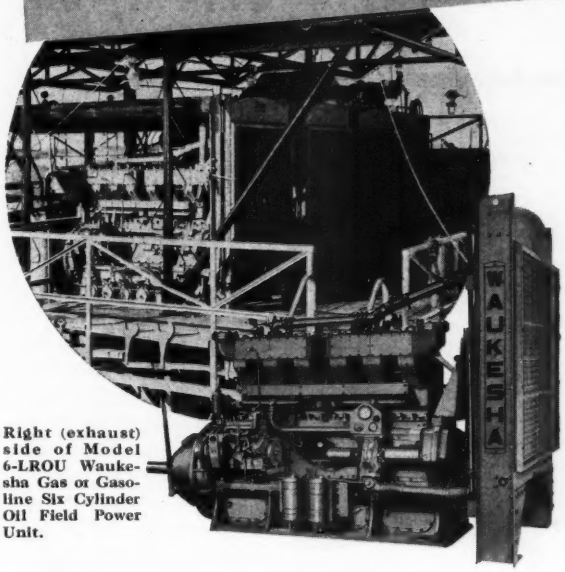
* * *

The timely comment of Mr. Ickes on the subject of Valentine scrip may have its effect when the Senate Judiciary Committee holds its hearings—now scheduled somewhat hazily for January—on the quitclaim resolution. Ickes, in effect, scotched any attempt to connect the Interior Department with Valentine scrip applications which City Attorney Smith, of Long Beach, charged were involved in a "conspiracy" to obtain title to submerged lands off the shores of Southern California. The two specific cases referred to by the Long Beach official involved the attempted use of scrip.

. . . However, numerous applications have been filed with the Interior Department in the past 10 years in which scrip does not figure. Perhaps the most important is an application submitted by C. P. Ritter and W. W. Chapin, as this was among the "one, or more" leases in the Long Beach-Seal Beach area which Ickes promised, early last spring, to grant.

The Ritter-Chapin application is for an oil and gas lease and does not involve scrip. Neither do nearly 150 applications for oil and gas leases filed with the Interior Department. This compares with between 20 and

WAUKESHA-POWERED
Four-Engine RIG
makes more hole...
FASTER AND DEEPER



Right (exhaust) side of Model 6-LROU Waukesha Gas or Gasoline Six Cylinder Oil Field Power Unit.

● The derrick is the world's tallest—202 ft. The rig, say its makers, is the largest on the market—an Ideal Type 125 *Consolidated*. It's adequately powered with Model 6-LROU 6-cyl., 8½ x 8½ in. bore and stroke, 2894 cu. in. displ. Waukesha Oil Field Power Units—*four of 'em*—burning natural gas and developing an aggregate maximum of 1600 horsepower. The location—4 miles northeast of Monahans, Texas, where deep production, to about 11000 ft., was discovered about three years ago by one of the large oil companies.

Using the big derrick, with 5⁹/₁₆ in. pipe and 135 ft. stands, this Waukesha-powered set-up with its four Waukesha units has *super-power*—fast, flexible, smooth, responsive—to carry on the drilling program.

Normally two Waukeshas operate one of the heavy duty NSCO Model C-350 pumps, the other pair drives the drawworks and rotary table. Three engines may be used for either job. Usually one engine is available for mixing mud. With these four Waukesha Engines, the rig has a high standby factor. Three engines can always run the entire rig at practically full efficiency. At any time one engine may be serviced without interrupting operations. *Get* Bulletin 840. Consult Waukesha engineers on your future engine needs.

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.
NEW YORK • TULSA • LOS ANGELES

WAUKESHA
OIL FIELD POWER UNITS

30 applications involving Valentine scrip.

Giving Mr. Ickes all credit for his sustained stand against the use of scrip in applications having to do with mineral-bearing lands, the beach lands on which some of the applications have been filed are not all proven to be oil-bearing. Also, from Washington, it appears that applicants for Federal leases — whether dabbling in scrip, or applying for an out-and-out oil and gas lease—are all on the same "side of the fence" (i.e., hoping for a ruling that the tidelands belong to the U. S.). . . .

* * *

Hearings on the McCarran tide lands resolution appeared more definite than at any time since the Supreme Court filed its suit against California. Some members of both House and Senate are reported burned by the casual manner in which the Justice Department's complaint assumes the States never did have title to the tidelands; the Thirteen Original States—touchy about anything which so much as questions their sovereignty — particularly disliked the observation that they did not own the lands underlying the three-mile belt at the time of the formation of the Union. Texas State officials are said to be muttering over the unexpected move of their fellow-Texan, U. S. Atty. Gen. Tom C. Clark, against California, despite Tom Clark's huge popularity in his home State and in Washington.

Some Senators expressed the fear the hearings might be set aside because of Congressional deference to the Supreme Court. This worry was pretty well abandoned, however, when Ickes vigorously reiterated his intention to appear before the Judiciary Committee in person to present the Interior Department's case. . . . He was given every opportunity to back out, when a reporter asked the hay-maker question of whether he would "consider it an affront to the Supreme Court" to have Congress deliberate the tidelands matter while the Highest Tribunal was pondering the same problem.

With Chairman Pat McCarran (D., Nev.) out of town, no definite date has been set for the hearings. Committee officials look for January action.

* * *

Proponents of the campaign to preserve States' rights to the tidelands are quietly hoping for a change in Justice Department action against California. If other States should intervene, or if the complaint should be changed so the other states were joined in the action, they figure a nation-wide holler would go up that would guarantee enactment of the tidelands legislation. If enough noise was made, a veto from President Truman would look less probable, according to this school of thought . . . Meanwhile, the United States Chamber of Commerce—one of the most powerful business lobbies in the Nation—is getting set to jump into the tidelands fracas with all the ammunition it commands.

The streamlined re-draft of the Anglo-American Petroleum Treaty has been sent to the Senate by President Truman with the blessings of the American oil industry and high hopes the Senate Foreign Relations Committee will act speedily to bring

FOR EFFICIENT CLEANING

pH Control has proved to be the key to a new, high standard of efficiency in washing and cleaning. It is one of the reasons why Kelite materials save time and money.

Protexol—loosens oil & grease for quick, easy rinse-off
Pro-Star—simplifies removal of hard, dried-on crude oil
Kelite No: 158—cleans tools, valves, machinery parts
G-Stripper—reclaims oil drums economically
Scale-Off—removes rust & scale without harming healthy metal
KDL No. 24—makes steam a powerful all-purpose cleaning aid

Wherever there's dirt, grease, scale, corrosion—any undesirable deposit or contamination—Kelite materials with pH Control can provide efficient cleaning. ***Ask your local Kelite Service Engineer, or write:*** Kelite Products, Inc., P. O. Box 2917, Terminal Annex Station, Los Angeles 54, Calif.

"Kelite" Reg. U. S. Pat. Off.

KELITE

Pacific LINER FABRICATING SERVICE

MAKE efficient use of the pipe you have on hand and eliminate need for hard-to-get NEW pipe by having Pacific fabricate your liners for you! Simply send blank pipe from your racks to Pacific's yard and specify size, type and number of slots (and whether Keystone or straight). Pacific will clean the pipe if needed and perforate it to your specifications on special machines. *Result*—a liner tailored to your well—and at a saving in money and materials! Take advantage of this service on your next well completion. Call—or write—Pacific for full details, *and ask also about Pacific Pre-Packed Gravel Liners for solving costly sand problems.*

PACIFIC

PACIFIC PERFORATING CO.
Torrance, Calif. - Phone Torrance 500
21st and Union Avenue
Bakersfield, Calif.

the pact to the Senate floor for a vote. According to Ickes, the treaty is a definite improvement over the original draft and contains nothing to frighten American interests which might like to set up shop in the Middle East.

Bandini Wells Explore Ahead

C.C.M.O. Co., Bandini No. 1 in sec. 21-2s-12w in the Bandini area east of Los Angeles continues to drill steadily ahead at a depth below 4500 ft. In sec. 9, Richfield Oil Corp., U. P. Unit No. 1 is redrilling at 7600 ft. and in sec. 15, Simons No. 1 has reached 3500 ft.

C. G. Willis, Pansini No. 1 in sec. 23 of the township is still standing with 7-in. casing cemented on bottom at 8195 ft. awaiting outcome of the U. P. Unit No. 1, before taking further operational action.

BUY VICTORY BONDS

Raisin City Test Begins

The Petrol Corp. has commenced drilling its No. 1-22, a wildcat test in sec. 22-15-19 near the community of Raisin City, and was last reported making swift time below 600 ft.

The company apparently was unable to develop production from the lower portion of Petrol No. 2-14 in sec. 14 and has plugged back to 5160 ft. Now standing squeezed through four holes shot at 5113 ft., the next move will be gun perforating and a test above this level.

RENTALS

By The Manufacturer

VERNON-CORWIN DESANDERS

VERNON-McNEELY VIBRATING MUD SCREENS

VERNON TOOL CO., LTD.

1101 Meridian Ave., Alhambra
Telephones CU 31206
Long Beach 42403

DOUBLE PLAY!

Many emulsions are stabilized by the presence of wax particles.

NOBS new combination chemical dehydrates oil and re-suspends wax in one operation, reducing cost of production.

NOBS DEHYDRATING CORPORATION

2465 East 53rd St.
Los Angeles 11, Calif.
Kimball 9288

With *five* Bowen Service Stores located strategically in principal California fields, it's easy to get the kind of fast fishing tool service you want when a fishing job comes your way—*call Bowen!*

Bowen has put emphasis on full stocks of tools at all stores, adequate rolling stock for all fields, and big staffs of trained, experienced service men for all calls. *Result: A fishing tool service unmatched in California fields.*

So next time—when minutes count—call the Bowen branch near you. It costs you no more—it can save you so much!

BOWEN FISHING TOOL COMPANY
SANTA FE SPRINGS, CALIFORNIA
VENTURA • BAKERSFIELD • AVENAL • SANTA MARIA
CASPER, WYOMING
Export: J. S. BOWEN CO. 30 ROCKEFELLER PLAZA, NEW YORK, N. Y.

BUDA ENGINES

Natural Gas--Butane--Gasoline--Diesel

GASO POWER PUMPS

Parts and Service

•

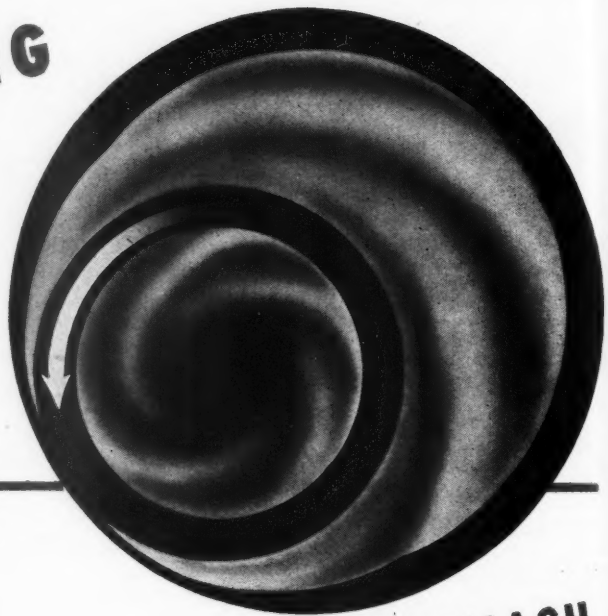
PRODUCTION EQUIPMENT COMPANY

651 East Gage Avenue
Los Angeles 1, Calif.

3271 Cherry Avenue
Long Beach 7, California

CASING PROTECTORS • STABILIZERS • PIPE WIPERS • WIRE LINE GUIDES • WIRE LINE WIPERS • KELLY WIPERS
KELLY SUB PROTECTORS • MUD GUNS • MUD GUN NOZZLES • SWIVEL BAIL BUMPERS • DEAD LINE STABILIZERS
TRAVELING BLOCK BUMPERS • TUBING PROTECTORS • SUCKER ROD WIPERS • TUBING WIPERS

CUT THE HOLE *NOT* THE CASING



A 6½" tool joint at 120 revolutions per minute grinds against casing at the rate of 2.2 miles per hour, or roughly 50 miles per day. In a 12,000 foot well there are 400 tool joints, each 20" long, which is equal to a 666 foot bar of steel grinding against casing at this rate.

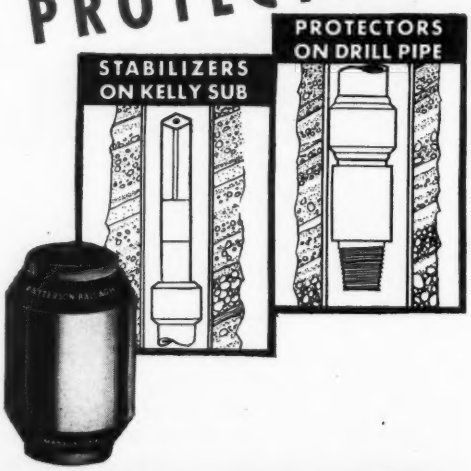
It would be a lot of work for an elephant to have to drag a bar like that 50 miles per day, but it is a lot worse when this bar is dragging on your power and wearing holes in your casing that *someday* may cost you a fortune.

PATTERSON-BALLAGH PROTECTORS

Patterson-Ballagh Protectors prevent metal to metal tool joint and casing wear, and they guide rotary power straight down to the bit where it pays. Well over 100 twirling tons of drill pipe, hanging below the table, put punishing stresses on tools needlessly if Protectors are not used to cut costly troubles.

Protector-wise drillers add many feet per day to their proud records by the easy, special tool method of slipping a Patterson-Ballagh Protector over each joint as they run the drill pipe in. Prepare to protect profits on your next pull out and run in by calling in your Patterson-Ballagh representative now! Let him help you make hole most effectively in this simple inexpensive way.

This is the wear-saving Patterson-Ballagh Lip Protector. There's a size for your job!



"Best Bet Yet"

PATTERSON-BALLAGH

LOS ANGELES 1 • HOUSTON 10 • NEW YORK 6

Patterson-Ballagh
Drill Pipe & Casing Protectors

Now Made of PBX Synthetic Rubber . . . Oil and Weather Resistant

Field Development

PREPARED BY CALIFORNIA OIL WORLD NEWS SERVICE

Los Angeles Basin

Del Valle Wildcat Standing Cemented

Universal Consolidated - T. E. Adams' Aguirre No. 1 in sec. 13-4n-18w, a westerly extension test, remains standing cemented due to bad roads caused by recent heavy rain. Depth is 3049 ft., with 7-in. at 2987 ft.

The 100-acre lease is on the Jesus and Concepcion Aguirre property, a part of one of the oldest estates in California.

The Superior Oil Co. and British-American Oil Prod. Co., Handy No. 1 in sec. 18 of the township is making headway at 9869 ft.

Gardena Test Again To Fore

Ohio Oil Co., Gardena Comm. No. 1 in sec. 24-3s-14w near the town of Gardena, a center of Los Angeles Basin oil interests for several weeks, is reported flowing by heads 250 to 300 barrels per day of 28 gravity oil, with no water, but some mud. Interval being tested is a company secret. Total depth is 10,594 ft.

C.C.M.O. Sponsors Torrance Project

C.C.M.O. Co. is preparing to drill Torrance No. 93, a Ranger zone test, located 150 ft. westerly and a like distance southerly from projected C/L of Monterey St. and Date Ave. in the old Torrance field.

The zone scheduled to undergo questioning is comparatively new in the production picture at Torrance.

Leffingwell Try Drills and Cores

Standard Oil Co., Lewis Comm. No. 1 in sec. 11-3s-11w in the Leffingwell area east of Santa Fe Springs field is drilling ahead and spot coring at 10,919 ft., without official intimation of developments. Drilling was recently resumed in the well, following a series of tests above original bottom at 10,635 ft.

Los Angeles Try Testing Uphole

Seaboard Oil Co., L. A. Brick No. 1 in sec. 21-1s-13w, a mile from the City Hall adjacent to Elysian Park, is preparing to plug and test an interval at approximately 1700-1800 ft. after trials of lower showings reacted unfavorably.

Oil sand encountered in the zone next in line for testing apparently is below depth attained by any well previously drilled in this part of the old L. A. City field. These early drilling jobs did not go much beyond 1200 ft.

The Seaboard wildcat went to a total depth of 7505 ft. in upper Miocene shale. The 7-in. is set at 5365 ft.

Beach Test Cores Deep

Shell Oil Co., Inc., Alamitos No. 48-A in the Long Beach area is coring 14,800 ft., a depth obviously critical and straining mechanical equipment. A scheduled basement test, developments as far as petroleum is concerned are but known to the company.

Buena Park Try Cased

On the outskirts of Buena Park in Orange County, General Petroleum Corp. Librown No. 1 wildcat in sec. 21-3s-11w has set a protection string on bottom at 12,045 ft. Whatever may have been uncovered to present depth, the operator intends to consummate a thorough prospectus of petroleum at this location.

New Del Valle Drilling Jobs

Claude Kavannaugh, Los Angeles operator, is preparing to drill a wildcat in the Del Valle area, 1155 ft. south and 1155 ft. west of the center of sec. 8-4n-17w.

Another drilling job in prospect is Herley & Kelley's Orduno No. 3, location for which has been staked 1520 ft. south and 165 ft. east from the north quarter corner of sec. 18.

East Coyote Well Finished

A new producing well has been added at East Coyote by Robert W. Ogle, Tuffree No. 1 in sec. 19-3s-9w, which pumped an estimated 50 barrels of oil a day from a total depth of 3343 ft. The 7-in. is cemented at 3190 ft.

Castaic "Cat" Disappointing

O'Kane & Brain, Inc., Barnsdall No. 1 in sec. 17-5n-16w in the Castaic area was at last reports bailing water, a sequel to gun-perforating between 1650 and 1710 ft. Other intervals tested recovered water. Bottom is 3184 ft.

La Habra Well Redrills Ahead

In the La Habra Heights area between Whittier and Fullerton Union Oil Co. is redrilling its Sansinena

ENGINES

New—Rebuilt—Used
for Sale or Rent

COMMANDO
Continental Red Seal Marine 6-cylinder, 160 H.P. Low prices. Immediate shipment.

HERCULES JXC from the barrage balloon winches. Also transmissions and thousands of feet of steel cable 3/16" and 7/32".

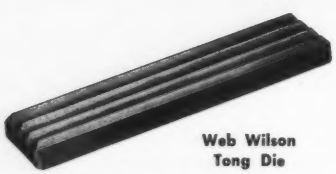
CASE POWER UNITS
New. Three sizes from 20 to 70 H.P. available for immediate shipments. Reliable. Dust proof.

LIGHTING PLANTS and all kinds of handling equipment for oil fields.

WELDERS
Gas-electric Hobart 300 amp., skid mounted. 100 ft. welding cord included. Price f.o.b. L.A. $675.00. Gas-electric G.E. 400 amp., skid mounted. 100 ft. welding cord. Price f.o.b. L.A. $750.00. Will rent with option to buy. Wire or telephone today. Ask for Roy Thrailkill.

BROWN-BEVIS EQUIPMENT CO.
4900 Santa Fe Ave., Los Angeles 11, Calif.
Phone JE-5221
Branch: 610 Jefferson St., Phoenix, Ariz.

"It's a Wilson"



Web Wilson
Tong Die

The longer life of WEB WILSON Tong Dies has been proven by independent tests. Superior design and production benefit you. Test our claims by a trial.
See Composite Catalog Pages 3101 to 3120.

WEB WILSON
Oil Tools
W. W. WILSON BUILDING
HUNTINGTON PARK, CALIF.

No. 16 in sec. 33-2s-10w, Los Angeles County, at 2528 feet.

A wildcat test, location falls 1½ miles southeast of the company's discovery well, completed some months ago at a total depth of 3596 ft. from the Puente formation.

Palmdale Test Makes Progress

Del Sur Oil Co., Del Sur No. 1 in sec. 26-7n-13w, northwest of the town of Palmdale in Los Angeles County, has reached a depth of 450 ft. and is cleaning out. Previous exploratory ventures drilled in the general area were production failures, several of which, however, found some shows.

Kraemer Prospect Pumping Water

Mid Cal Pet. Co., Mid Pet. No. No. K-1 in sec. 24-3s-9w in the Kraemer area of Orange County apparently missed production in drilling to a total depth of 2600 ft. At last reports the try was pumping fresh water at the rate of 25 barrels a day.

L. A. City Test Pouring Foundation

Not far from the intersection of Ramona and Westminster Blvds., the Dumm Bros.-Olympic Refining combination is pouring foundation for well No. 16, some 500 ft. south and 1020 ft. east from the north quarter corner of sec. 29-1s-12w. The leasehold embraces 500 acres.

West Newport Explorer Quits

D. D. Dunlap and Dorothy Dunlap, Aldrich No. 2 in sec. 18-6s-10w in the northwesterly extension of the West Newport field in Orange County has been abandoned in gray sand at a redrilled depth of 2972 ft.

Southwest of the abandoned well, Mohla Oil Co., Atha-S.L.W. No. 7-13 in sec. 13-6s-11w is trying to squeeze off perforations, after swabbing water. Hole is bottomed at 3323 ft., with 8⅝-inch casing set at 1900 ft.

Meanwhile, Barnhart Morrow is grading location for Deeble No. 5 some 1120 ft. north and 2290 ft. east of the south quarter corner of sec. 18-6s-10w.

Eastman
CASING ROLLER

A very effective tool for rolling out collapsed or rough casing and liners. The specially formed blunt nose, the hardened roller pins, lubrication channels and circulation passages are all carefully designed to give smooth and continuous action, and to get the desired results quickly and at minimum cost.

For field service...data on sizes available... or other information, call...

Eastman
OIL WELL SURVEY SERVICE
Dallas, Texas Denver, Colo. Long Beach, Calif. Houston, Lafayette, Okla. City, Bakersfield, Ventura, Casper
Export Office, 2895 Long Beach Blvd., Long Beach, Calif.

General Drilling Co.

CONTRACTORS
SUPERVISION

"Remember, it's the last cost that counts, not the first."

Suite 1215
453 So. Spring St.
Los Angeles, Calif.

Telephone: Michigan 6316

Gato Ridge Location Made

Quincy Cass Associates, Los Angeles investment firm, has staked location for Arata No. 2 in the Gato Ridge field. Location falls 204 ft. north and 202 ft. west from Corner C in sec. 4-8n-32w, Santa Barbara County.

Coastal and Northern District

Cat Canyon Active Area

The Cat Canyon field in the Solomon Hills, Santa Barbara County, continues its development program.

Union Oil Co., McNee No. 4 in sec. 20-9n-32w is drilling at 8485 ft. The company's Bell No. 27 in sec. 36-9n-33w is drilling at 4845 ft., after cementing 8⅝-in. casing at 4700 ft. Five other wells are making progress on the Bell lease.

In sec. 27-9n-32w, Palos Verdes Estates, Inc., is rigging to start the drill in its P. C. No. 2.

Kirby Hills Area Program Keeps On

Approximately 11 miles west of the Rio Vista gas field, Shell Oil Co., Inc., has staked location for Lambie No. 4 in the Kirby Hills area of Solano County in sec. 25-4n-1w.

Shell discovered the field about a year ago, and since then has completed three other gassers, which produced gas at an extraordinary rate.

New Field Try At Half Moon Bay

E. T. Willard, Trustee, is the sponsor of a new wildcat test in the Half Moon Bay area of San Mateo County. Drill site has been selected 450 ft. due south of the most northerly corner of the Sarah Wilson property in sec. 15-6s-5w.

Standard Drilling At West Rio Vista

Standard Oil Co., Natural Gas Corp-Bacon No. 1 in sec. 29-4n-1e in the West Rio Vista area of Solano County is making progress in sand at 4008 ft. Fontana Farms No. 4 in sec. 31 in the Rio Vista area is down 1490 ft.

Honolulu Oil Corp. and Barnsdall Oil Co., Liberty Farms No. 2 in sec. 12-5n-2e is making headway at 3656 ft.

Lompoc Wildcat Getting Deeper

General Petroleum Corp., Los Alamos No. 3 in sec. 31-8n-33w in the Lompoc area is drilling ahead at 3750 ft. in quest of new oil. Formation trials of respective intervals at 3400-3531 ft. and 3641-3733 ft. gave but little encouragement.

Oceanic Enters Torrey Sector

Oceanic Oil Co., which has apparently embarked upon a wide program of extensive oil development, has entered the Torrey Canyon area of Ventura County and staked location for Hunter No. 1 wildcat, 1090 ft. north and 1160 ft. east of the southwest corner of sec. 32-4n-18w. It will go down several miles north of the Torrey Canyon field.

Padre Canyon Well Flowing

Continental Oil Co.'s Grubb lease in the Padre Canyon field has added another substantial producing well, No. A-1, in sec. 23-3n-24w. It flowed 803 barrels of 29.3 gravity oil per day, cutting 6.2 per cent through variable beans. Gas yield is 424 MCF. Depth is 7530 and plug at 7480, with shut off at 6635 ft.

New Field Try Stands Cemented

On ground owned by Peter Cooper Bryce, New York and Santa Barbara business man and socialite, Western Gulf Oil Co., wildcat in sec. 30-4n-25w in the Carpinteria area is standing with casing cemented on bottom at 1280 ft.

Snowball Anticline Wildcat Suspended

On the Snowball anticline above the north edge of Carpinteria Valley, M. T. Grubb, Operator, Snowball No. 1 in sec. 19-4n-24w has been suspended, following swabbing operations, which recovered some gas from perforations between 4210-4350 ft. The well is an old hole abandoned some years ago. Grubb, a prominent Oklahoma oil man, took it over to carry ahead to more conclusive depths.

Ojai Venture Shows On Ditch

Following an electric log run to bottom at 5211 ft., Volunteer Pet. Corp., Hilltop No. 2 in sec. 7-4n-21w in the Ojai area, Ventura County, is reaming hard shale. Oil is showing on the ditch and casing may be run for a test. The company's Pyramid No. 1 in the same section remains idle at 35 ft.

Modelo Well Plans Test

Having recovered the drill pipe fish to 10,128 ft. and plugged the hole to 8430 ft., Pacific Western Oil Corp. is ready to run blank liner for a conventional test. Present depth is 10,504 ft.

The try is located in the Modelo field in Ventura County, sec. 7-4n-18w, amidst relatively shallowly producers, bottomed between 1000 and 1300 ft.

Fullerton Preparing Coastal Drilling Job

In the Rincon field on the coast near Ventura, Fullerton Oil Co. has a cellar in for Hobson State No. 45-5 on sec. 17-3n-24w.

Beloil Corp., Ltd. has completed its Hobson State No. 145-4 at a total depth of 4537 ft. for 162 barrels of 30.1 gravity crude oil and 200 MCF a day through a 4/64-in. bean. Casing is set at 3370 ft.

Meanwhile, C.C.M.O. Co., Hobson No. C-11 continues to drill steadily ahead at 13,865 ft.

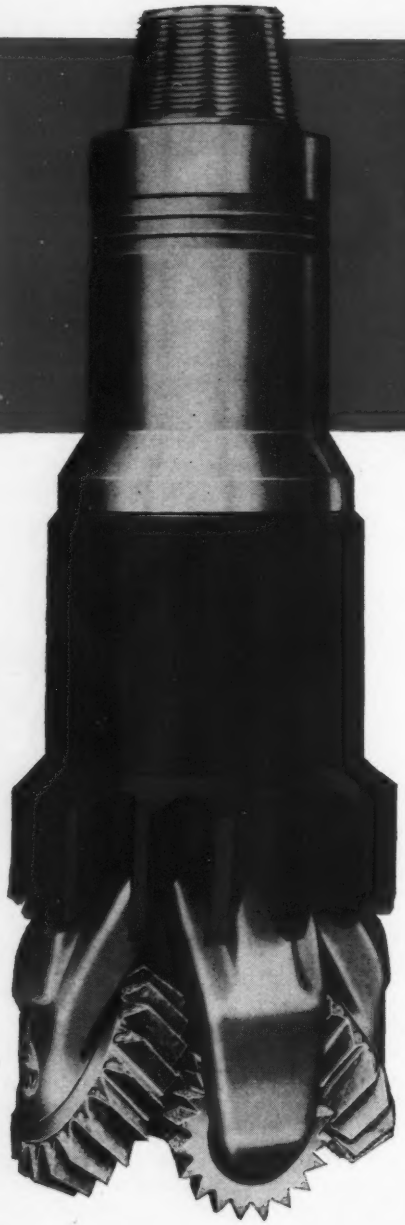
So. Mtn. Attracts New Drilling Project

M. & M. Associates (Ed. E. McWhirter and Arthur C. Miller) of Newhall has graded location for well No. 2 in the South Mountain field in sec. 13-3n-21w.

F. E. Fairfield is preparing to drill S.M. No. 7 in sec. 19-3n-19w. S.M. No. 6 is rigging to pump. Depth of the latter is 4900 ft., with the shut off at 3140 ft.

Los Nietos Co. & Lucy Smith Battson, C. & H. No. 1 in sec. 22-3n-21w is idle at a redrilled depth of 5130 ft. Original depth was 6315 ft.

for use on any and every drilling well - - - and on any type of bit



GLOBE SIDE HOLE CUTTER

(PATENT APPLIED FOR)

Maintains Full Gage Hole While Drilling:

Maintain full-gage hole all the way to bottom as you drill, with any type of drilling bit.

Eliminates Reaming:

No reaming necessary when running in new bit. Cutter has 10 to 12 point contact as compared to 3 point contact of ordinary reamers.

Stabilizes Drilling Bit:

Prevents the bit from walking around on bottom, and hole from going off vertical, in any formation.

Runs On Every Type Bit:

Install immediately above bit, as shown in illustration. Cutter is less distance off bottom than diameter of hole. Should be run on every drilling bit.

No Moving Parts To Lose In Hole.

The Globe Side Hole Cutter is the most valuable drilling aid developed in years. Saves time; eliminates reaming; assures longer runs, faster drilling, and full gage straight hole; and cuts drilling costs. Ask any Globe office or distributor for detailed information.

GLOBE OIL TOOLS COMPANY

Ventura, California
Petroleum Service Company
Hoke Tool Company

LOS NIETOS, CALIFORNIA

Bakersfield, California
Avenal and Santa Maria, California
Houston, Texas—New Iberia, Louisiana

Representative For Southern Texas, Louisiana and Mississippi

Houston Oil Field Materials Company, Inc.
Empire Oil Field Machinery Company
Mountain Sales & Service
S. E. Wycoff Bit Shop

Houston, Texas and Branches
Odessa, Texas
Casper, Wyoming
Great Bend, Kansas

San Joaquin Valley

Oceanic Discovery Starts New Drilling

Independent Exploration Co., Oceanic No. 1 in sec. 22-29s-21e, which came in to prominence in recent weeks by an important oil discovery in the Belridge 64 zone at Cymric in Kern County, is currently producing 715 barrels of 37.7 gravity oil a day through an 18/64-in. bean. Gas output is 392 MCF.

Approximately 1320 ft. due west of Oceanic No. 1, the Dumm Bros.-Olympic Refining combination has staked location for well No. 17 in sec. 22. Vernon King is the engineer in charge.

Honolulu Oil Corp.'s two offsets —one south of the discovery and a second east—have foundations in. They are No. 47-22 and No. 56-22.

Superior Oil Co. has staked location for Woody No. 57-22, a southeasterly offset. Standard Oil Co., Fitzgerald No. 55 in sec. 24 is drilling at 5580 ft. in brown shale. Independent Exploration, Cymric No. 1 in sec. 21 is making headway at 1750 ft.

Chowchilla Try Swabs Little Gas

The Chowchilla No. 1 of Continental and Western Gulf in sec. 7-10s-14e in the Chowchilla area of Madera County, swabbed water with very little gas, after hole was bridged at 2573 ft. and tubing with packer run to 2525 ft. Total depth is 8402 ft.

Oil Search Looms At Miramonte Area

Pacific Western Oil Corp. has staked location for National Royalty No. 1, a wildcat test, some 7 miles northeast of the Lost Hills field in sec. 5-26s-22e.

Santiago Wells Miss Oil Sand

Southeast of the old Sunset field in the Santiago area, Richfield Oil Corp., Leutholz No. A-3 in sec. 22-11n-23w missed the sand and plugged back to 2250 ft. to redrill. Total depth was 3443 ft. in shale.

Western Gulf Oil Co., Woodward-USL No. 4 also missed the sand and is now redrilling at 1059 ft. from plugged depth at 695 ft. Total depth was 3328 ft. in shale.

The Texas Co., Western Minerals Fee No. 1 in sec. 21, a recent completion, is currently producing 583 barrels of 19.8 gravity oil a day, along with 100 MCF of gas.

Tulare Try Location Made

Elmer C. Von Glahn, agriculturalist and oil man, has staked location for Green Cattle No. 1 wildcat test, some 5 miles southeast of the town of Corcoran in sec. 33-21s-23e, Tulare County.

The Kings County Oil Co. of Corcoran is preparing to deepen a well drilled and abandoned by Mr. Von Glahn two years ago in the Liberty Farms area in Kings County. The well is located in sec. 4-23-22 and will be carried ahead to possibly 11,000 ft. from present depth at 9600 ft.

Shale Hills Test Coring Brown Shale

In Shale Hills, B. C. Morrison, Mountford No. 2 in sec. 18-27s-19e is coring at 2675 ft. in brown shale. The try was reported in the Miocene at 2400 feet, more or less.

New Edison Try Starts Drilling

Northeast of the Edison field proper, Harold J. Johnson has spudded in O'Neil No. 1 in sec. 8-30s-30e and is drilling at 780 ft.

The Texas Co., Hintz No. 1 in sec. 23-30s-29e drilled to 443 ft. and is now fishing for drill collar and bit. The 10¾-in. casing is cemented at 257 ft.

California Exploration Co., Porter No. 1 in sec. 17 is drilling at 650 ft.

Paloma Drilling Time Accelerated

Superior Oil Co., Anderson No. 18-35 in sec. 35-31s-26e at Paloma is drilling at 5539 ft. after making rapid time since spudding in. Including the time of cementing 13⅜-in. casing at 1514 ft., the footage was made in four days and three hours.

Hogan Petroleum Co., Symons-Two No. 27-7 in sec. 7-32s-27e drilled to 11,763 ft. and is plugging back to test the Symons zone. The 7-in. casing is cemented at 11,270 ft.

According to a check-up of Western Gulf activities in the area, Paloma Unit No. 32-33 in sec. 33-31s-26e is drilling at 10,873 ft. in oil sand. No. 81-33 is coring at 11,429 ft. in oil sand, and No. 85-34 in sec. 34-31s-26e is drilling at 10,881 ft. A location has been staked for Paloma Unit No. 61-2 in sec. 2-32s-26e.

Lost Hills Test Standing Squeezed

Standard Oil Co., Cahn No. 58-4, which was originally intended as a deep test below 10,000 ft., with the Eocene as the objective, tested wet through 4 holes shot at 8645 ft. and is now standing squeezed with 84 sax. It flowed salt water on the test. Drill site is at the south end of the Lost Hill structure in sec. 2-27-21.

Buttonwillow Adds Wildcat Operations

Three miles south of the Buttonwillow gas field, Transcal Drilling Co. is rigging to drill a wildcat test, some 700 ft. south and a like distance west of the northeast corner of sec. 30-28s-23e. Gus Pongratz has the drilling contract.

Belridge Try Drills Ahead

Belridge Oil Co., No. 58A-18 wildcat test located 200 ft. north and 2481 ft. west from the southeast corner of sec. 18-28s-21e has been spudded in and last was reported making headway in shallow formations at 580 ft.

Lanare Well Starts Work

In the Lanare area of Fresno County, where Amerada Petroleum, Superior Oil and a number of other operating organizations already

have developed production, Pacific Western Oil Corp. has foundation in for Dodini No. 1 in sec. 14-17-18.

Pyramid Hills Try Bails Little Fluid

A short distance from a number of shallow producers owned by Standard Oil Co. in the Pyramid Hills of Kings County, F. S. & D. Oil Co., Core Hole No. 1 in sec. 8-24s-18e is idle at a plugged depth of 831 ft. after bailing but little fluid. Original depth was 905 ft.

Antelope Hills Producer Looms

Having cored 40 ft. of good looking oil sand, Williams Bros. Oil Co. is ready to complete its Layman No. 5 in sec. 12-28-19 in the Antelope Hills area. Depth is 821 ft., with 7-in. cemented at 741 ft. A flowing well is expected. Location for Layman No. 6 has been staked in the same section.

The Mitchel Co., Mitchel Fee No. 1 in the section was drilled to 850 ft., which was as far as the equipment could go and consequently was abandoned. Further drilling will be done on the property.

Jacalitos Adds Flowing Oiler

Wilshire Oil Co., No. 78-26e in sec. 26-21s-15e has come to a happy ending flowing through a 24/64-in. casing bean at 1170 barrel per day rate from a total depth of 4560 ft. Crude tested 41-deg. gravity. The water shut off was effected at 4410 ft.

Standard Oil Co., Ferguson No. 54 in sec. 6-22s-16e is coring at 5790 ft. in claystone. The company is rigging up Reay No. 22-E in sec. 22.

San Emidio Area Development Proceeds

Western Gulf Oil Co., Los Lobos No. A-1 in sec. 4-10n-22w is drilling at 3303 ft. in brown shale. In the meantime, Los Lobos No. A-2-1 in sec. 34-11n-22w is cleaning out preparatory to trial of shut off on 7-in. casing cemented at 3145 ft. A test also will be made off showings reportedly logged from 3066 to 3083 ft.

Grapevine Test Rigging Derrick

In the Grapevine area of Kern County, British-American Oil Prod. Co. is rigging up its Tejon Ranch No. 41-5 in sec. 5-10n-19w, with drilling start anticipated shortly.

Tejon Oil Co., Tejon No. 1-A in sec. 19 continues to fish for drill pipe, top of which is at 7400 ft. Hole is bottomed at 10,328 ft.

New Life At Jasmine

Tide Water Associated Oil Co. is drilling Carver No. 41 in sec. 19-25s-28e in the Jasmine area of Kern County at 1152 ft. Its Villard No. 72 in sec. 32 of the township is grading ground.

Utility Oil Associates, Quinn No. 4A in sec. 15 on production test bailed water from an interval perforated between 2800 and 2900 ft. Total depth is 2901 ft.

On sec. 25, Beverly Trading & Explr. Co. is rigging up Orange Land Co. No. 1. Drilling contract has been let to Miller & York.

In The Oil and Gas Fields

are numberless locations where

Calco Spiral Welded Pipe

serves efficiently in the conveyance of Oil, Gas, Gasoline or Compressed Air. Convenient, effective, lasting. Send for your copy of The Handbook of Welded Steel Pipe.

California Corrugated Culvert Co.

2610 Parker St. Berkeley

407 LeRoy St. Los Angeles

TUBBS VICTORY CORDAGE COMPANY

NO. 1 SISAL ROPE

NOW BACK!

Available to you without restrictions

Government controls have now been lifted from Sisal rope. It will be welcome news to rope users that you can now purchase Sisal for every purpose.

Present restrictions continue on Manila rope but we hope it will not be too long before you see the familiar Tubbs Extra Superior Manila trademark once again.

In the meantime, you will find Tubbs VICTORY Brand No. 1 Sisal a dependable rope. Having 75% of the strength of Manila, Victory is made with the same exacting care in our mills.

for VICTORY Rope

TUBBS CORDAGE COMPANY

San Francisco Seattle

Los Angeles Chicago Portland New York

THIS LAUGH

OFF!!

Fanny Hurst acquired a beautiful figure after a rigorous diet. The late Irvin Cobb didn't recognize her. "Well," said Fanny, "aren't you going to talk to me?" "Golly," said Cobb, "it's Fanny Hurst!" "Yes," she agreed, "the same Fanny Hurst." "Not quite," said the wit. "It may be the same Hurst, but it certainly isn't the same Fanny!"

There ain't no justice
In this here land;
Just got a divorce
From my old man.
I laughed and laughed
At the court's decision;
They gave him the kids,
And the kids ain't his'n.

"Well, bless my wool," said the ram as he plunged over the cliff. "I didn't see that ewe turn."

They are putting so much of a certain item in the G.I. food that several of the boys have been starting their letters to their sweethearts, "Dear friend."

Courtship is that period during which a girl decides whether or not she can do better.

If you've got the jack you can always draw the queens.

If a WAC is a lady soldier and a WAVE is a lady sailor . . . what is a WOC?

Answer: A WOC is something wittle boys fwow at wabbits.

Bill: "Did you hear about the terrible accident that happened an the way to the Scotchman's picnic?"

John: "No, what was it?"

Bill: "Two taxicabs collided and 18 Scotchmen were hurt."

Dick: "I hear Brown is the father of twins."

Paul: "Yes, he married a telephone girl and she gave him the wrong number."

She calls her latest affair a football romance . . . she's waiting for the old guy to kick off.

"What do you mean I have baby hands?"

"They're beginning to creep."

A new formula for preventing nose bleed . . . keep it out of other people's business.

The little black boy didn't mind being called "Midnight" by his little white playmates, but when another little black boy called him "Midnight" he indignantly exclaimed: "You's jes' about a quarter to 12 you'sef."

"Where I made my mistake," said the childless movie star, "was in marrying a director instead of a producer."

Visitor: "Your daughter is screaming in the parlor. Aren't you worried?"

Mother: "No, the time to start worrying, I have found, is when she stops screaming."

"You know what a stork is?"

"It's a great, big, ugly bird that flies along in the wake of a lark."

The Sunday School teacher had been telling the children a story of spring, and the miracle of the growth of the Easter lily. "Now, children," she said, "which one of you can tell me what makes the lily spring from this little bulb?"

"God does it," said one little boy.

Another boy raised his hand and shouted, 'Fertilizer helps."

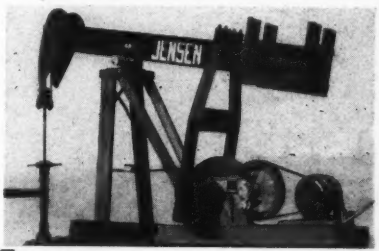
"Were there any powder marks on the body of the deceased man?" asked the coroner.

"Certainly, there were powder marks," replied the wife. "In fact, that's why I shot him."

New Father (over the telephone): "I want you to insert the announcement of the birth of twins."

Editor (not understanding): "Will you repeat that?"

New Father: "Not if I can help it."



Something On the Ball!

The JENSEN Unit has something on the ball that you won't find in ordinary pumping equipment. Call it experience, engineering, or whatever you like. It all adds up to the fact that a JENSEN Unit is likely to make any California well more profitable and dependable.

For facts and figures you can't afford to ignore, get in touch now with . . .

California Representative:
A. V. TURNER
445 W. 6th, Downey, Calif.
Phone: Topaz 2-2410

Stocked by
THE OIL TOOL CORPORATION
3075 Cherry Avenue, Long Beach, Cal.
Phone 481-81

JENSEN
BROTHERS MFG. CO.
14th and Pacific Streets
COFFEYVILLE, KANSAS, U. S. A.
EXPORT OFFICE, 50 Church St.
New York City

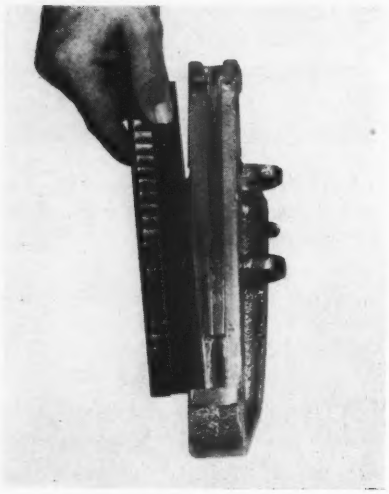
Baash-Ross Drill Collar Slips

Two new advancements have recently been incorporated in the Baash-Ross Drill Collar Slips, assuring even longer service and easier maintenance on this equipment. Baash-Ross Drill Collar Slips are designed on a unique principle. Because the diameter of drill collars is constantly changing as they wear against the abrasive fresh-cut walls of the hole, the conventional broad-faced type of slip does not readily adjust itself to this changing circumference. Baash-Ross Drill Collar Slips, on the other hand, are especially designed with multiple narrow segments flexibly linked together so that the slips wrap around the collar similar to a chain tong, enabling them to fit any drill collar whether it is new, worn, round, or out-of-round.

By simply removing stainless steel rod, slip liner is readily removed.

Forged Steel Bodies

As a result of recent manufacturing advancements each of these narrow body segments in the Drill Collar Slips is now made of tough forged steel instead of the cast construction formerly used. Because of the tougher and denser metal structure produced by the forging operation, this new development gives Baash-Ross Drill Collar Slips still greater resistance to the impacts of rough rig service and to the stresses of maximum slip loads.



After removing stainless steel rod, liner is easily removed from body.

Corrosion-Proof Liner Retention

The second advancement is in the construction of the liner retention device. The method by which the liners are held in the body segments of Baash-Ross Drill Collar Slips is both simple and positive. To replace a worn liner it is only necessary to remove the cotter key and pull out the liner retaining key, whereupon the liner may be easily removed from the body. To make this operation even easier, the liner retaining key is now made of stainless steel, eliminating the possibilitity of any rust or chemical corrosion interfering with quick easy liner replacements.

Baash-Ross Drill Collar Slips showing narrow segments flexibly linked together.

For further information regarding these two new advancements on the Baash-Ross Drill Collar Slips write the Baash-Ross Tool Company, 5512 Boyle Avenue, Los Angeles 11, California.

Universal Announces New Cat Cracker

Invention and development by Universal Oil Products Company of a catalytic cracking unit of radically new design was announced recently by Dr. Gustav Egloff of Universal at a luncheon meeting of the Mexican-American Conference on Industrial Research which was sponsored by the Illinois Institute of Technology.

This new U.O.P. cat cracker can be installed at low cost and fitted to small-scale refining operations. It makes practical for the small refiner the use of the most modern procedures and technique of catalytic cracking to produce superior quality aviation and motor gasoline. It puts within his reach the same advantages which the large companies long have enjoyed in catalytic cracking.

Following Dr. Egloff's address, the members of the conference visited the Universal laboratories at Riverside, a Chicago suburb, where they were conducted on a 2-hour tour of inspection through all departments, observing hydrocarbon research in action.

In those laboratories the world's first program of research in catalysis, as applied to petroleum refining was initiated more than a decade before Pearl Harbor, with foresight that today seems uncanny if not providential, because from that research work stemmed the processes that provided the 100-octane gasoline, high quality military motor gasoline, components of synthetic rubber and toluene for the production of T. N.T. Without those processes the needs of the United Nations for war products could not have been met.

The new U.O.P. cat cracker is the newest achievement of that research and development program.

GEOLOGICAL ASSISTANT

Large Oil Company requires services of experienced man in home office in East. Salary to fit the man. Write full particulars, education, experience, references. Reply to B-53, P.O. Box 3495, Philadelphia 22, Pa.

Bernie Thompson Becomes Halliburton Sales Representative on the Pacific Coast

Coming up from the ranks of driving a cementing truck before the war, and with an outstanding service record with the Army Air Forces in Europe, this fine young man with an experienced background has been assigned to fill the post formerly held by James G. Creed in the Los Angeles office. Mr. Creed resigned in January, 1945, to enter the oil producing business.

Capt. Bernie Thompson

Bernie Thompson was a captain and a B-24 pilot in the 8th Air Forces. He completed 35 missions over Germany, including the bombing of Berlin, was awarded the Distinguished Flying Cross with Oak Leaf Cluster, the Air Medal with five Oak Leaf Clusters, the European Theater of Operations Campaign Ribbon with four Battle Stars, and two Presidential Citations.

Bernie is married to Francia White, a California girl who is one of the outstanding radio singers who has appeared on top programs.

Halliburton is proud to reemploy such a fine young man who contributed so much to the future security of our country.

BUY VICTORY BONDS

New Corporation Set-Up for Bechtel Brothers McCone Company

Currently announced at its San Francisco headquarters is the formation of Bechtel Brothers McCone Company, a new corporation engaging in the engineering and construction business.

Executives and key personnel have been drawn from the Bechtel and the Bechtel-McCone interests, extensively identified with major construction on the Pacific Coast principally, but also embracing a number of projects in Alaska, Canada, the Caribbean area, the Persian Gulf, and the Philippines. The Board of Directors consist of S. D. Bechtel, John A. McCone, K. K. Bechtel, John L. Simpson; W. E. Waste, President; J. P. Yates and Van W. Rosendahl, Executive Vice Presidents; Jerome K. Doolan and V. G. Hindmarsh, Vice Presidents.

W. E. Waste, President, and former Vice President and General Manager of Marinship Corporation, defines the Bechtel Brothers McCone Company enterprise as "an engineering and construction service for industrials and government bodies, placing special emphasis on work required by the petroleum, mining, chemical and other heavy process industries; railroads, public utilities and government authorities."

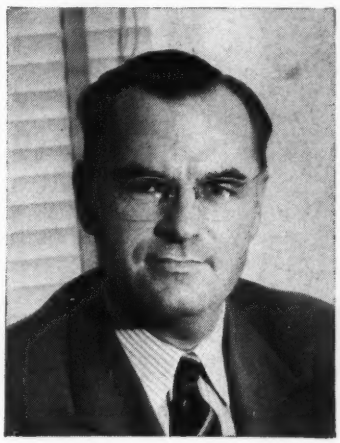
The principals of the organization have managed the design and construction of a substantial volume of private and public works, including oil refineries; oil, gas and water pipe lines, pumping systems, chemical plants, food process plants, mines and ore reduction plants, railroads; ports and terminals, power plants and electrical distribution systems; industrial housing and office buildings; shipyards, shipbuilding and repair; bridges, tunnels, dams and highways.

The Bechtel and Bechtel McCone interests have also administered and operated aircraft modification and automotive equipment reconditioning plants, harbor facilities and port systems.

"Offices will be maintained in San Francisco, Los Angeles, and other cities to be announced," Mr. Waste stated.

Lane-Wells Personnel Changes

Ray A. Hancock, on military leave since April 20, 1941, has returned to resume his former position as California Division Operating Superintendent, and Keith Miner has been appointed California Division Sales Manager, according to an announcement by James W. McPhee, California Division Manager of Lane-Wells Company.



Ray A. Hancock

Hancock, a Lieut-Commander, U. S.N.R., first joined Lane-Wells in 1938. He served in Naval Communications in the Marshall Islands and later Pearl Harbor.

Keith Miner

Miner has been with Lane-Wells since 1937 and has been serving in several field capacities including that of California Operating Superintendent.

Finney Advanced by Standard

Charles E. Finney, Jr., has been elected by the board of directors of Standard of California to the position of assistant vice-president — manufacturing.

C. E. Finney, Jr.

At the same time, Francis H. Smith was named general manager of the manufacturing department, in charge of operations and process planning and control, and A. C. Moorhead was appointed personnel director of the manufacturing department.

Finney, a graduate of Cornell University with a degree in mechanical engineering, joined Standard in 1919 at the company's Richmond, Calif., refinery. In 1928 he was appointed assistant superintendent of the refinery and subsequently manager of the pressure distillation department there.

In 1931 Finney went to El Paso, Texas, as manager of the Pastotex refinery, operated by a subsidiary company. Two years later he returned to California as manager of the Richmond plant. In 1933 he was transferred to the company's head office in San Francisco where he became successively chairman of the manufacturing committee, assistant general manager of the manufacturing department, and in 1943, general manager of the department.

Smith began working for Standard in 1913 at the El Segundo, Calif., refinery. Fifteen years later he was transferred to the Richmond refinery as superintendent, and in 1934 became manager of this refinery. In 1944 he was named assistant general manager of manufacturing, with headquarters in San Francisco.

Moorhead, a graduate of the University of California in mechanical engineering, was employed by Standard in 1917 at the Richmond, Calif., refinery. He has a background of refinery, personnel and industrial relations management, both at the refineries and at the company's San Francisco headquarters. In 1943 he was appointed assistant general manager of the manufacturing department.

Francis H. Smith

Paul Howard Resigns to Enter Private Practice

Paul J. Howard, Oil and Mining Valuation Engineer and former Assistant Assessor of Kern County, announces his entry into private practice as a Consulting Engineer, Geologist and Tax Counsellor.

Mr. Howard entered the service in Kern County nine years ago and established methods for the valuation of oil and mining properties now in use in this county. Prior to this work, he served for eight years as a Petroluem Engineer for the State Division of Oil and Gas in both the Los Angeles Basin and the San Joaquin Valley.

Majoring in Petroleum Engineering, Howard graduated from the University of California, College of Mining in 1924, later taking a graduate course in Oil Property Valuation at the University of Southern California. He is the author of many technical articles on oil and mining. Many will remember his part in representing Kern County at Washington, D. C., in the successful battle to prevent Government condemnation of private lands in Elk Hills, Buena Vista Hills and Coles Levee. His active participation in technical and civic affairs is indicated by his membership in American Institute of Mining and Metallurgical Engineers, American Association of Petroleum Geologists, Kern County Chamber of Commerce (Chairman, Oil & Mining Committee), Kern County Post War Planning Council (Director, Natural Resources Division).

Paul J. Howard

Mr. Howard's many years' experience in oil and mining valuation and county tax work particularly fit him to serve in these as well as in other engineering capacities. His headquarters for the present will be at his home, 101 Flower Street, Bakersfield, telephone 2-8324, or when in Los Angeles at GRanite 8209.

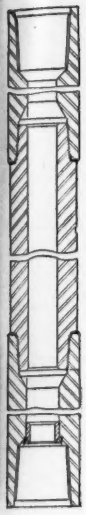
WELL GEOLOGISTS

To watch progress of wells in Eastern Venezuela. Care for samples, picks, casing points, core points, etc. Write

THE ATLANTIC REFINING CO.

(Rm. 900) P.O. Box 7258, Philadelphia 1, Pa.

Non-Magnetic Drill Collar—Introduced by Sperry-Sun



Sperry-Sun Well Surveying Company has recently added to its line of well surveying instruments and services a new service, the S-S Non-Magnetic Drill Collar rental.

The use of this drill collar permits the taking of directional single shot records inside of the drill pipe. There is no need to remove the drill pipe from the hole or to raise the drill string to allow the instrument to dangle through a specially designed, but inefficient, bit.

The S-S Non-magnetic Drill Collar is located immediately above the regular bit and the non-magnetic section carries the directional single shot instrument and protects it against both loss and damage. The records obtained are more accurate because the instrument, being seated inside of the drill collar, is always parallel to its walls.

The non-magnetic sections of the S-S drill collar are made of "K" Monel metal, the physical properties of which are as high or higher than those of the best steel used in the manufacture of drill collars made from steel.

A cross section of the S-S drill collar is shown in Figure 1. It will be noted that the tool joints are made of steel and are welded to the "K" Monel metal section by a special welding process.

Extensive field tests which have been made with the non-magnetic drill collar have conclusively demonstrated that by its use directional single shot records can be obtained at a great saving of rig time, that the records obtained are more accurate and the operation of the single shot instrument is less hazardous. The use of the S-S Non-magnetic Drill Collar is particularly advantageous in directional drilling in which the reaching of the sub-surface objective with the least deviation and with the greatest saving of rig time, counts.

The S-S Non-Magnetic Drill Collars are made in standard sizes. At the present time there are available for rental at the company's Houston, Texas and Long Beach, California offices, drill collars of 6" O. D. and 6¾" O.D. Additional sizes will be made available in the near future.

New Steel Mills for West Coast

New steel-making and finishing facilities costing between $7- and $8,000,000 are to be built immediately by Bethlehem Steel Company at Los Angeles, California, according to H. H. Fuller, Vice President in charge of Bethlehem's West Coast steel activities.

"This is the beginning of a long range postwar building program by Bethlehem on the West Coast," Mr. Fuller states.

"Plans are completed for further extensions at least as great as this program, as soon as peacetime markets warrant. Since acquiring West Coast steel properties in 1930 at Seattle, South San Francisco and Los Angeles, Bethlehem has made numerous improvements in a schedule of expansion which is now ready to go forward at an accelerated pace.

"The new mills at Los Angeles will provide a full range of wire rods; a wide range of bars including rounds, squares, flats, angles, spring steel and reinforcing bars; and a wire department for the production of bright wire in 20 gauge and heavier.

"The detailed engineering is now in process and ground will be broken the first of the year.

"The improvements will be made at the Company's present plant and property which are located between Slauson Avenue and Randolph Street in the Vernon section.

New Open Hearth

"A new open hearth furnace of 4,000 tons capacity per month will be added to three present open hearths. The plant now makes 10-inch ingots weighing 1560 lbs. The new facilities are expected to provide 14-inch ingots weighing 3400 lbs.

Extend Bar Range

"The new bar mill facilities will include a 30-inch, 3-high billet mill and a combination 12-in.-10-in. 8-inch bar mill. This improvement will make obsolete the present 12-inch mill extending the range of products above and below. The present mill rolls up to 1¼-inch rounds, whereas the new equipment will roll up to 2½-inch rounds. It will also roll down to the smallest rod dimension, namely .207-inches. The new mill will be on the east side of the property along the Union Pacific tracks.

"The wire mill will occupy the first bay of the warehouse and an addition to be built adjacent to it. At the same time, another warehouse bay will be built on the north side to compensate for the space taken by the new mill.

"The present project calls for three new buildings, plus the warehouse additions. The two bar and rod mill buildings will cover 119,000 square feet. The warehouse additions, including the new wire section, will cover 64,400 square feet, and there will be a building for wire storage covering 10,000 square feet."

KERN'S LADY PALEONTOLOGIST:

Not to be outdone by Miss Mia Suverkrop, Standard Oil's contribution to the geological department ala womanpower, Betty Loudon turned in her likeness after a debate with "mamma" and "Papa" Loudon who have just relinquished all studio rights. Miss Loudon, a graduate of Mills (C.O.W. Second Issue, March) with a degree in Science and zoology opens samples for Stanley Beck, an Independent Consultant, and diagnoses all oil well ailments which go back at least a million years. Congratulations, Miss Loudon.

General Motors Diesel Division Appoint Anderson-O'Brien

The appointment of Anderson-O'Brien Company as retail sales outlet for the GM series 71 Diesel engine, with headquarters at 746 E. Washington Boulevard, Los Angeles, was announced recently by V. C. Genn, General Sales Manager for the Detroit Diesel Engine Division of General Motors Corporation.

A. N. Anderson, who will be the Sales Manager, brings to the company over 10 years' experience in selling and servicing diesel engines in all lines of industry. For the past seven years he has been associated with the Sales Department of Detroit Diesel, supervising applications of its diesel engines to diverse industrial products.

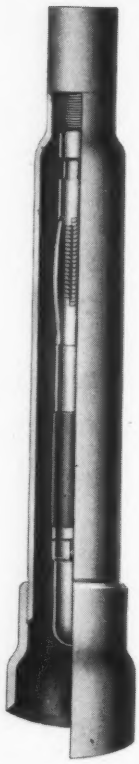
Milt O'Brien will direct the Service activities of the Anderson-O'Brien Company and is well qualified for this assignment, having served in Executive Service capacities for the Pontiac and Buick Divisions and on the Service staff of General Motors Corporation.

The Anderson-O'Brien Company assumes responsibility for sales and service of the GM Series 71 engines for Irrigation, Oil Fields, Mining and Contractors' machinery, in the counties of San Diego, Orange, Inyo, Imperial, Los Angeles, Kern, Riverside, San Bernardino, Santa Barbara, San Luis Obispo and Ventura. The Company also will cover the Marine industry in the counties of Santa Barbara, San Luis Obispo and Ventura.

In producing thousands of engines for military requirements in all theatres of war, Detroit Diesel gained additional experience which assures continuation of production of efficient, economic, space-saving engines for industrial needs, work boats and for pleasure craft. The Detroit Diesel Series 71 engine, which created such a fine record in tanks, landing craft, tractors, bulldozers, shovels and other implements during the war, is now available for all industrial and Marine applications. A wide range of sizes, from 34 horsepower 2 cylinder engine to the 800 horsepower 24-cylinder "Quad", are now offered.

Bowen Rotary Releasing Spear

With Skirt and Guide For Drill Pipe or Tubing



A Rotary Releasing Spear with skirt and guide, especially designed and developed for use in catching drill pipe or tubing, has been announced by S. R. Bowen Company, Huntington Beach, California. It is a particularly valuable tool for use on fishing jobs where adverse hole conditions exist, and where the top of the drill pipe or tubing is leaning against the side of the hole. It provides an effective means of guiding the fish to the center of the hole and up over the spear where it can be held and pulled out of the hole. This adaptation of the Bowen Spear is becoming very popular with operators using internal flush drill pipe, as the same tool can be used to catch and pack off the fish whether pipe, coupling or tool joint is up.

The tool comprises essentially a standard pack-off type spear assembled within a skirt of sufficient diameter to slip down easily over the drill pipe or tubing. As shown in the illustration, an oversize guide is threaded to the skirt at the bottom to assist in locating the fish and centering it, and a top sub provides connection between the spear and the run-in string. Oversize guides are removable so that a guide of any dimension may be installed on the skirt.

When run in the hole, the tool is rotated slowly immediately upon contact with the top of the fish to enable the guide to center the fish in the hole. Then, the tool is lowered in the usual manner so that the spear enters the fish its full length. The friction springs contact the inner walls of the fish, carrying the cage up and against the shoulder on the body and bringing the slips to their uppermost position. The string is then rotated a sixth of a turn to the left. The springs hold the cage and slips stationary, and the rotation places the tapered faces of the body directly beneath the slips. Thereafter, when upward pull is exerted, the slips are expanded against the wall of the fish and the hold is secure. Easy release is effected by simply dropping the weight of the fishing string against the tool and rotating a sixth of a turn to the right to bring the neutral slots behind the slips. The tool can be set, released and re-set as often as desired without coming out of the hole.

If it is desired to circulate through the fish to facilitate its removal, it is only necessary to set the spear and turn on the pumps. This will expand the pack-off rubber tightly against the inner wall of the fish and thus force the circulation through it.

The Bowen Spear with skirt and guide attachment is available in a complete range of sizes for tubing and drill pipe, in both right and left hand types and with horizontally or vertically cut slip wickers for all spear operations. Full details can be obtained from S. R. Bowen Company, Huntington Beach, California, or 30 Rockefeller Plaza, New York.

FIELD GEOLOGIST

Exploration work in Venezuela. Should have 3 years experience in mapping Rocky Mountains, California or Foreign. Write to

THE ATLANTIC REFINING CO.
(Rm. 900) P.O. Box 7258, Philadelphia 1, Pa.

GEOLOGIST-SUBSURFACE

For Venezuela, five years experience, preferably foreign.

THE ATLANTIC REFINING CO.
(Rm. 900) P.O. Box 7258, Philadelphia 1, Pa.

GEOPHYSICIST

To act as field supervisor of contract parties. Eastern Venezuela. Write to

THE ATLANTIC REFINING CO.
(Rm. 900) P.O. Box 7258, Philadelphia 1, Pa.